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MODEL AIRPLANE NEWS

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ON THE COVER: *main photo—Larry Alles of Flemington, NJ, flew this very impressive 40-percent Waco YMF-5 at the 1997 Westport, NY, Big Bird IMAA Fly-In. Inset: NEPRO Quickie 500 action in Farmington, CT.*

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EDITORIAL

by LARRY MARSHALL

THINK-BUILDING IS FREE

Most modelers spend a lot of time talking with their buddies about models they're going to build. Together, they'll ponder powerplant requirements, how to construct this or that, which hardware will be used and where to get documentation (if it's a scale plane), and they'll even discuss probable flight characteristics. It's what we do; it's who we are. Often, these planned projects are never built, but it doesn't really matter, as there's much fun in this planning.

These activities go further than casual conversation. It's clearly the case that plans for model airplanes generate far more sales than they generate real balsa and ply model airplanes. I've got hundreds of them and enjoy them the way I enjoy fine wine and a good book, though plans seem to go better with coffee. Plans act as teaching tools; there's no doubt about that. But they also stimulate our imaginations in much the same way as our toys did when we were kids. Back then, we didn't have to own a horse to be a cowboy; we could imagine it. And so it goes with model aviation, as most modelers have a lot of fun with these, "I'm gonna build a ..." thoughts and actions.

Best of all, this part of our hobby is inexpensive. We can (and most of us do) have lots of fun "think-building" several models in parallel with a real project we have on the building board. We can do it while we're driving to work, standing in line at the grocery store, or even while watching a movie that our spouses like a lot more than we do. We can even do it while we eat. Heck, I've had dreams about building projects, so I guess think-building can be done while you sleep, too. If nothing else, like Orville Wright, we can lie in bed and think about flying.

Just think how much less enjoyment there would be in our hobby if we didn't think-build. It boggles the mind. Those of us in the magazine business try hard to stimulate that imagination. Club meetings typically have periods when someone who has a new set of plans rolls them out, and a "think" session begins where half-a-dozen versions of the plane are built. Certainly, pit areas around the world are full of this sort of think-building. Ain't it great?

So, next time someone tells you our hobby is expensive, explain how many hours of pleasure you get for free. And heavens, if someone complains that you're not making enough progress on your current building project, just tell him you've been busy think-building.

"In fact, I had got more kick out of flying before I had ever been in the air—while lying in bed thinking of how exciting it would be." —Orville Wright

Ready to commit aviation, Jean Chevalier brought his new SkyTech Aviation* 33-percent-scale Superstar. The model has a 102-inch span and is powered by a Q-65.

QUICKIES, GIANTS AND SAILPLANES

Quickie 500 racing got its start with the notion that we needed an entry-level pylon-racing event because the other classes were just too fast for newcomers to the fray. Of course, like any area of racing, Q500 models have become faster and faster and more and more expensive; today, Quickie 500 is dominated by Nelson-powered go-fast planes that are truly incredible—at least most of the time. But in New England, they still do "stock" Quickie racing, and we're bringing you Rick Bell's insights into the fun that can be had with this form of racing.

Gerry Yarrish came back from the Westport IMAA meet with a big grin on his face. He relates the reasons why for those of you who like the big stuff. Hope you enjoy his insights into the 250+ models in attendance.

AirSCOOP

by CHRIS CHIANELLI

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

Friend Ship 40

According to Air Conquest Celebration, their new Friend Ship 40 trainer combines a crash-resistant design and aerodynamic beauty—no box or stick fuselage here. They also contend the model is simple to assemble and possesses excellent flight characteristics, being very docile for the beginner. Made of foam with a rigid, wooden, inner structure, the model is reported to be strong. It's covered with Air Conquest's exclusive "glassine-polyester" film and formed plastic—a clean, attractive finish. Specifications: wingspan—61 inches; wing area—732 square inches; engine recommended—.40 to .46 2-stroke; radio required—4-channel. Introductory price is only $79.60 (plus S&H). For more information, contact Pablo Rivera, 105 East Hillside, Larado, TX; (210) 724-4594; fax (210) 724-6653.

8-CELL MITCHELL

Following on the heels of the C-47, P-38 and deHavilland Mosquito, Hobby Lobby now introduces this 53-inch-wingspan B-25 from the Czech Republic. This kit has a lightweight, fiberglass fuselage that has the wing center panel and engine nacelles all molded as one piece. The outboard wing panels are ready built and are of balsa rib and spar construction with full balsa sheeting. Hobby Lobby reports the airplane can be assembled quickly. Specifications: length—40.5 inches; airfoil—Selig 3021; wing and stab area—510 square inches (approximately); weight—50 ounces; wing/stab loading—14 ounces/ square foot; radio required—throttle, ailerons (plus two mini servos) and elevator control; power—8-cell Ni-Cd pack and two Speed 400 motors with 2.3:1 gearboxes. For more information, contact Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948.

No-Fear Falcon

In my humble opinion, the F-16 Fighting Falcon from U.S. AirCore is the coolest model to come from this company so far. Using AirCore's patented corrugated, polypropylene construction technology, the F-16 will reach speeds that equal those of more expensive wooden jets, plus it is extremely crash-resilient—a perfect choice for the competent sport pilot considering a first jet; it's one to hone your skills on and gain combat confidence with. Features include: CAD parts with slot-and-tab assembly, fuselage bottom panels for easy radio access, internal straight-run pushrods for positive control and high-speed-flutter resistance, molded-in colors with jet-like markings and optional wingtip "Sidewinder" missiles. Specs. wingspan—43 inches; wing area—414 square inches; weight—6 pounds; engine required—.40 to .46 2-stroke. For more information, contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

100 buys 90!

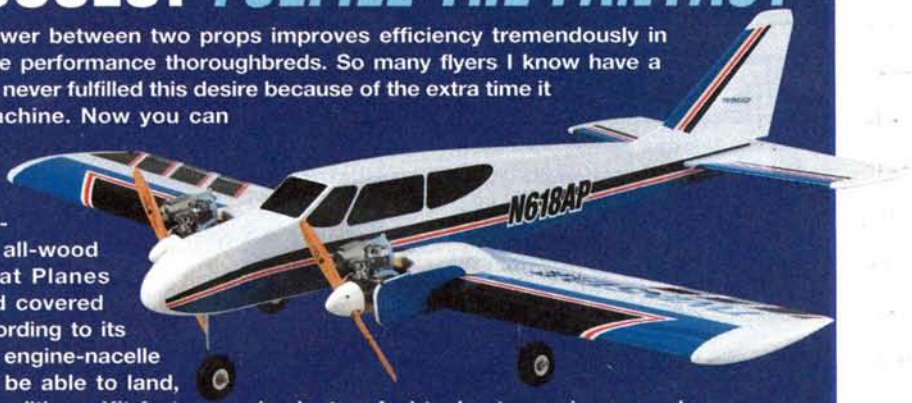
This new J3 Cub and AT-6 Texan from Global Hobbies are 90 percent built—and each costs less than $100! These 4-channel wooden models come built, sanded and covered with Goldberg Ultracote. Cub specs: wingspan—48 inches; wing area—360 square inches; weight—3.2 pounds; engine required—.20 to .28 2-stroke. Texan specs: wingspan—44 inches; wing area—319 square inches; weight—2.8 pounds; engine required—.15 to .25 2-stroke. Both kits feature: preformed landing gear, peel-and-stick decal sheets, wheels, pushrods, fuel tank, molded canopy (windows for Cub) and hardware packs. The Cub features a fiberglass cowl with engine-cylinder detail, and the AT-6 features pre-installed wing-pushrod housings. For more information, contact Hobby Shack, 18480 Bandilier Circle, Fountain Valley, CA 92728; (714) 964-0827; fax (714) 962-6452.

Aveox/Robbe

Distribution for the high-quality Robbe Modellsport line of R/C products is now the exclusive responsibility of Aveox. This includes all electric-flight and glider products for the United States and Canada. Contact them for more information about this great line of products. Aveox Inc., 31324 Via Colinas #103, Westlake Village, CA 91362; (818) 597-8915; fax (818) 597-0617.

NO MORE EXCUSES! FULFILL THE FANTASY

Dividing an airframe's available power between two props improves efficiency tremendously in terms of thrust. In short: twins are performance thoroughbreds. So many flyers I know have a secret desire to own a twin. Most have never fulfilled this desire because of the extra time it takes to build the more complex machine. Now you can explore this "unknown entity" and become totally comfortable with the satisfying performance offered by a twin without having to set aside "winter-project" building time. Featuring all-wood interlocking construction, the Great Planes TwinStar comes 80 percent built and covered with film. But wait; there's more. According to its manufacturer, the close-to-centerline engine-nacelle placement ensures the TwinStar will be able to land, loop and roll under one-engine-out conditions. Kit features: wheels, two fuel tanks, two spinners and a generous hardware package. Specs: wingspan—56 inches; wing area—567 square inches; weight—5.5 to 6.5 pounds; wing loading—22.6 to 26.7 ounces/square foot; engine required—two .20 to .40 2-strokes; radio required—4-channel with five servos and a Y-harness. Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.

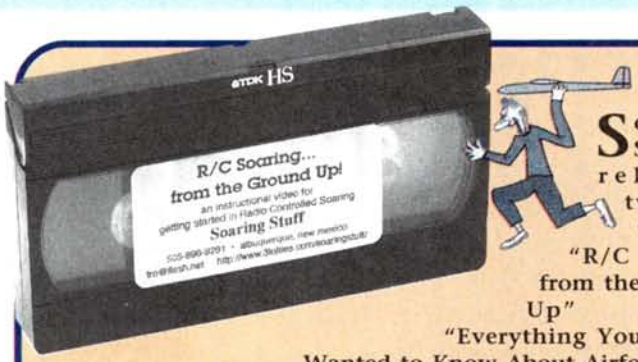


Different Sticks for Different Tricks

Because it has larger control surfaces, Horizon Hobbies claims that, compared with previous designs, their new Hangar 9 Super Stick is super nimble and more aerobatic and offers superior control authority at lower speeds. The aileron and elevator chords have been increased by 25 percent over previous stick norms. At high speeds, with full deflection, the roll rate is almost too fast to count, while elevator response gives 20-foot-diameter loops. For more positive control and mixing options, each aileron is driven by a separate servo. The Super Stick is a 90-percent-built ARF and comes covered with the modern scheme shown here. Features are: bolt-on wing, hardware for both tail-dragger and conventional landing gear and universal "clamp-on" aluminum engine mount that doesn't require drilling. Super Stick is available in .40 and .60-size versions. They accept a .50 to .56 4-stroke and .65 to .91 4-stroke, respectively. For more information, contact Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511.

Solder Anywhere Cordless Iron

BS Mfg. has released the Vulkan P200—a cordless gas-powered soldering iron and precision heating tool that delivers up to 135 watts of output. It's made of lightweight plastic and weighs 110 grams. The 15 attachment tips optimize the tool for soldering, cutting, slicing, heating, igniting, shrinking, melting, shaping and other uses. The fuel is liquid butane/propane gas, stored in the translucent handle in a similar fashion to a disposable cigarette lighter. Fill the tank with a squirt from a gas refill canister. Each refill provides up to three hours of continuous use at a typical setting for electronics soldering. For more information, contact BS Mfg., Strawhall Industrial Estate, Carlow, Ireland; 353 (0)503 41340; fax 353 (0)503 40363.



Soaring Stuff has released two new videos: "R/C Soaring from the Ground Up" and "Everything You Always Wanted to Know About Airfoils." The 90-minute R/C soaring video was produced with beginners in mind. It shows the entire process of building a 2-meter balsa sailplane and includes many hints and tips for building a strong, straight plane that will fly well. The video also features footage of the adjusting/trimming process and shows how to fly a sailplane. The airfoil video was produced in cooperation with Dr. Michael Selig and the University of Illinois Low-Speed Airfoil Testing Program. It explains, in non-engineering terms, how airfoils work, how to choose the right one for a project and how to evaluate airfoils on an existing design. The video shows wind-tunnel testing and explains how to use graphs (called "polars" by aerodynamicists) to choose an airfoil. A portion of the proceeds from the sales of this video will be donated to the university airfoil testing program. Prices: soaring video—$24.95 (NTSC format), $29.95 (PAL format); airfoil video—$29.95 (NTSC format), $34.95—PAL format (plus $3 S&H). For more information, contact Soaring Stuff, 9140 Guadelupe Trail NW, Albuquerque, NM 87114; phone/fax (505) 898-8281.

Soaring from A to Z

AIRWAVES

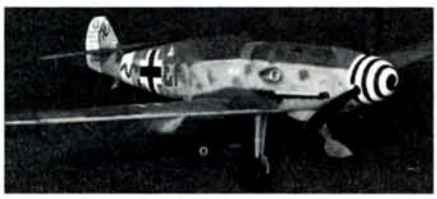
WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 100 East Ridge, Ridgefield, CT 06877-4606; email: man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous number of letters we receive, we can not respond to every one.

WHO'S THAT IN THAT EXTRA?

I love *Model Airplane News* and buy it every month. Your full-color coverage of Top Gun was great! In the September '97 issue, there was a review done by Mike DeHoyos of the Extra 300L from House of Balsa. I was wondering where I can get the pilot he used, whether it comes pre-painted and about how much it is. Thanks for the help, and keep up the great work!

JAMES SCUDAMORE
via email

Glad you liked the coverage; we certainly enjoyed being around all those magnificent models. Regarding the pilot in the Extra 300L, you're in luck because I actually know (grin!). That's "Mary," and she's available from Hobby Lobby, (615) 373-1444, for about $16. She does come hand-painted. LM



SCALE SPINNERS

I'm over 59, and I began building models when I was 10 years old. I recently got back into the hobby, and I really enjoy scratch-building. When I read *Model Airplane News* and I see articles about Top Gun, the same question always comes to mind, especially when I see models like the Messerschmitt Me-109G as featured in the September 1997 issue. So I decided to write and ask. Just how would one make the spinner for that aircraft? I'm sure that it is handmade and most likely made of fiberglass. But how would you attach it to the engine and propeller? There must be some sort of standard practice or method. I'm sure other readers out there would also like to know.

I enjoy reading *Model Airplane News* and look forward every month to the next issue. Keep up the good work.

PETER MANFRE
Alameda, CA

Peter, yes, the models at Top Gun are indeed impressive, and many do require specialized machine work to produce the parts used in their construction. Items such as spinners and scale landing-gear struts are often made by the modelers specifically for their one-of-a-kind aircraft. In the case of Pat McCurry's Me-109G, the spinner actually is commercially available—not a homemade affair. It is available from Meister Scale. The spinner is made of spun aluminum, not fiberglass. According to Pat, the backplate is also made of sheet metal and has a conical shape. It fits precisely into the back of the spinner cone, and then the spinner cone and the backplate are screwed together. Such a spinner is attached to the prop shaft in the same manner as a standard sport spinner and held in place with the prop and prop nut. Pat went to the trouble of countersinking the attachment screw holes that run along the aft edge of the spinner cone to preserve its scale outline. Care must be taken when spacing out and installing the mount screws to maintain proper balance.*

As with homemade flying propellers, home-brewed spinners intended for flight are not advisable unless the modeler has the proper knowledge, skill and equipment to produce one of sufficient strength for safe operation. Companies such as Meister Scale, Tru-Turn and Ohio R/C* produce high-quality flight spinners, and it is likely that a designer of a model will have source information for specialty spinners on his plans and/or instructions. Instructions with these spinners should be followed for proper mounting and operation.*

If you would like to know how to make a scale "static" (non-flying) spinner for your scale model, then check out Bob Underwood's "Scale Techniques" column in the November 1995 issue of Model Airplane News, page 86. GY

AILERONS FOR NIFTY 80

I would like to build the Nifty 80 as a winter project to use as an introduction to giant-scale modeling and flying. I wanted a 4-channel airplane with throttle, elevator, rudder and ailerons. After I placed an order for your plans, I noticed that the Nifty 80 does not use any ailerons. Not being a student of aerodynamics but enjoying coordinated flying, both rudder and ailerons, I would like to build the wing with ailerons. Please let me know whether this wing can be modified and, if possible, how to accomplish this without destroying the flying performance. Thank you in advance for your cooperation relating to this matter.

RICHARD M. DVORIN
via email

Rich, if one were to install ailerons on the Nifty 80, I would first recommend taking half of the dihedral out because with the dihedral shown on the plans, the model banks and turns beautifully with rudder and elevator only. I would also think that less dihedral will lessen the amount of adverse yaw produced by the ailerons.

Second and perhaps even more important, I strongly recommend adding an additional set of spars (aft spars of the same size as the main spars) to strengthen the wing. Place them under the leading edge of the TE sheeting, both top and bottom, and all should be fine. My original model, which I sold to someone (after many, many, many flights and general hard use), suffered a wing failure due to a broken main spar. But this was after much abuse. Adding the extra spars will make the wing very strong. Also, always use the lift struts.

With that said, either full-length strip ailerons or my preference, barn door ailerons, can easily be built into the wing. Simply cut the trailing edge about 2 inches back and add 3/8-inch sheet balsa for the LE of the aileron to mate to. Back up the hinge-point areas with additional 1/4-inch sheet from inside the wing for proper gluing area. Now cut back the front of the aileron portion of the wing you just removed about 1/4 inch and add a 1/4-inch balsa LE. Bevel and install your hinges. If you install barn-door ailerons, make them start at the aft edge of the new aft spar location, and make the ailerons a little less than half the length of the wing panel. Remember to install some plywood at the control-horn location for proper strength. The wing is big enough for direct control servos to be placed right in front of the ailerons. Good luck with your Nifty 80. GY

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

Pilot PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1997. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606.

BRAVO, BRAVO!

This Sig Morrisey Bravo was built by Dave Tomlinson of Lancaster, PA. The model's fuselage and tail feathers are covered with Super Coverite fabric and painted, and the wing is covered with MonoKote and has painted ABS wingtips. Dave added a detailed instrument panel and pilot and full operational flaps for the full-scale effect and short-field flying. A Quadra 42 keeps the 21.5-pound plane in the air.

FLOATIN' AROUND

S. Wingard of Marquette, MI, scratch-built this 80-inch-span, 1935 Taylor Cub Model E-2. It's covered with 21st Century Coverite fabric and is equipped with a K&B .40 engine and a McDaniel onboard navigation light system. The floats have foam cores and plywood skins. Mr. Wingard tells us that he hasn't yet flown his 5-pound model: "I'm waiting for that perfect day. It was fun to build, but I don't think I'll scratch one again; I'd rather be flying!"

RIVETING CESSNA

Jim Cox of Olathe, KS, spent three years scratch-building this 1946 Cessna 140. Before he finished the model, he went to a local airport and took hundreds of photos of two 140s hangared there and then handmade all the panels out of .003-inch aluminum he found at a scrap yard. Jim punched most of the rivets with a ballpoint pen and a hardwood block, but the rest are actually small pins that go into a former to hold the panels in place. The model is powered by an O.S. 1.60 twin engine and weighs about 16½ pounds.

FOR THE BIRDS

This plane-hangar bird feeder is the handiwork of Tom Wilk of Duluth, MN. Tom made the windsock out of MonoKote and built the seaplane from a child's hobby kit. We're sure Tom's feathered friends appreciate their unique airport restaurant.

JODEL D-9

Roy Brown, stationed in the U.K. with the U.S. Air Force, built this Jodel D-9 from *Model Airplane News* plans, modified it to have a full flying rudder and decorated it with the markings used on a Jodel in a recent *Kit Planes* magazine. The D-9 sports homemade wheels and a Czech Styrofoam pilot figure. Roy says that his 28-ounce model is "a very well-behaved and fun-to-fly airplane, even in the 30-knot winds at Old Warden."

PAIR OF CRUSADERS

Doug Knowlton of Denver, CO, sent this photo of himself and his Top Flite model next to Joe Thibodeau, pilot of the full-size P-51 in the background. Doug's 5-year-old son, Joshua, is in the cockpit. The model started out as a "Big Beautiful Doll," but after Joe gave Joshua a ride in his P-51, Doug decided to finish it as a "Crusader." The model has flaps, retractable landing gear and a Saito 150 in its nose.

DOUBLE VISION

This Top Flite Gold Edition Cessna Skylane is the handiwork of Michael Estock of Norristown, PA. Michael dressed the model up in 21st Century Super Coverite and detailed it with automotive paint to look just like the N2911E owned by Dave Cornish of Collegeville, PA. The model features a custom exhaust, scale interior and navigational lights.

TWICE AS NICE

Dick Baker of Falls Church, VA, decided to turn his Cermark ARC Sukhoi 26 into a one-of-a-kind scale project by modeling it after Don Rynald's full-size Sukhoi in Bealeton, VA. Don, who holds the model in the photo, flies competition aerobatics. The model is covered in Ultracote and sports custom markings from Kirby's Custom Vinyl Graphics. Dick adds, "You'll notice that my model has a small red hub while the full-scale plane has a black spinner .... When I first photographed the plane, it had a red metal hub. By the time I finished the model and returned to take this photo, Don had switched to the spinner. I have since fitted the model with a matching spinner."

COUPLE OF CAPS

Fifteen-year-old Jermaine Hale of Lexington, KY, sent this photo of his Midwest CAP 232 model in front of Matt Chapman's full-size CAP at the Joe Nall Fly-In in Greenville, SC. He dressed up his model in 21st Century film and Krylon paint and powers it with a Moki 1.8 engine. Jermaine flies sportsman pattern in IMAC competition and says that the CAP is an excellent performer.

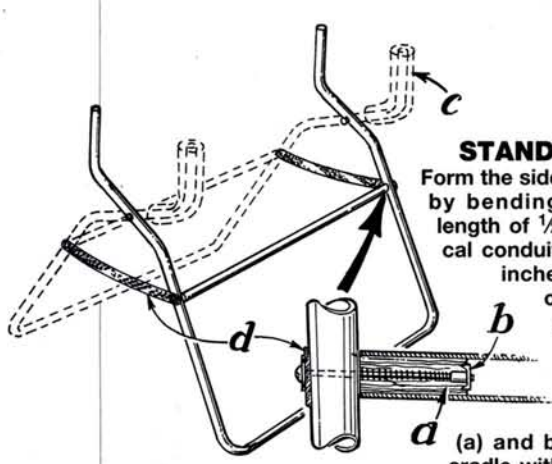
SECOND CESSNA

Jim Deutsch of Abilene, TX, is the proud owner of both Cessna 182s in this photo. He modeled the 1/5-scale Pica kit after his full-size plane and equipped it with flaps, lights and a Webra 1.2 up front. He confides, "Now, if I could only get a P-51 to copy!" We think some guys just don't know when they have it good!

Hints & KINKS

by JIM NEWMAN

Model Airplane News *will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o* Model Airplane News, *100 East Ridge, Ridgefield, CT 06877-4606. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.*



STANDING AROUND

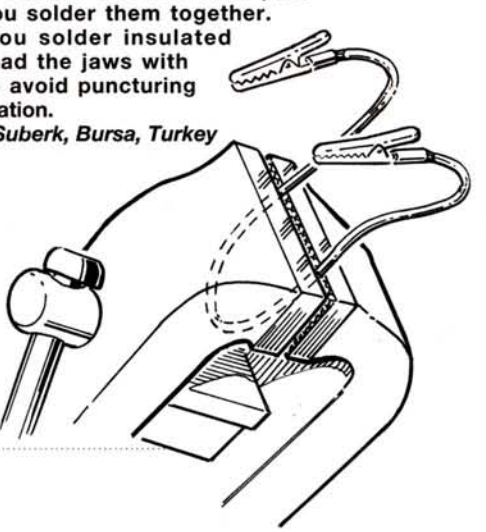
Form the sides of this model stand by bending a 10-foot (3.05m) length of ½-inch (13mm) electrical conduit to make a stand 32 inches (81cm) high at the cradle. Make it pivot using no. 8 screws and locknuts, then secure the brace with no. 8 screws through a dowel (a) and blindnut (b). Pad the cradle with foam insulation and sleeves (c). The spread is controlled with webbing (d).

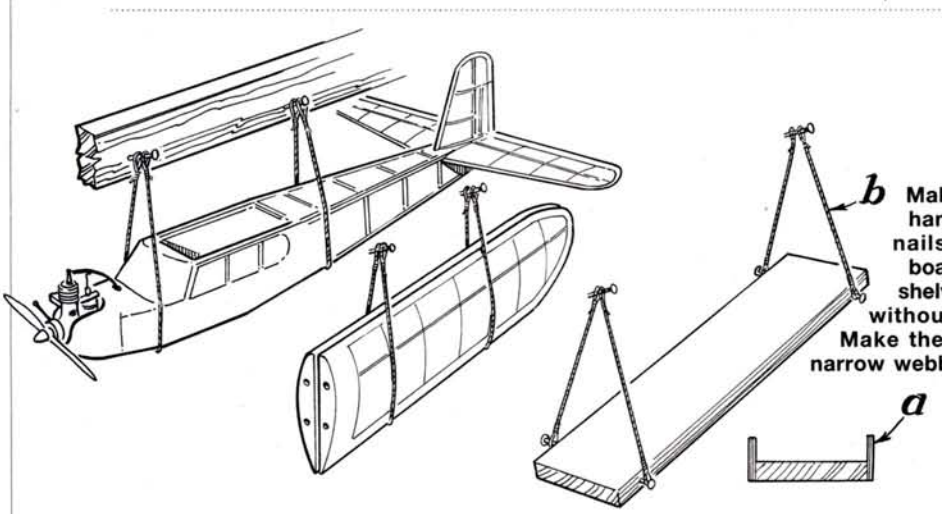
Paul Nesbitt, Suwanee, GA

EXTRA FINGERS

Solder a large crocodile clip to each end of a piece of no. 12 copper wire. Fold the wire in two, then clamp it in a vise and use it to hold small parts while you solder them together. When you solder insulated leads, pad the jaws with balsa to avoid puncturing the insulation.

Levent Suberk, Bursa, Turkey

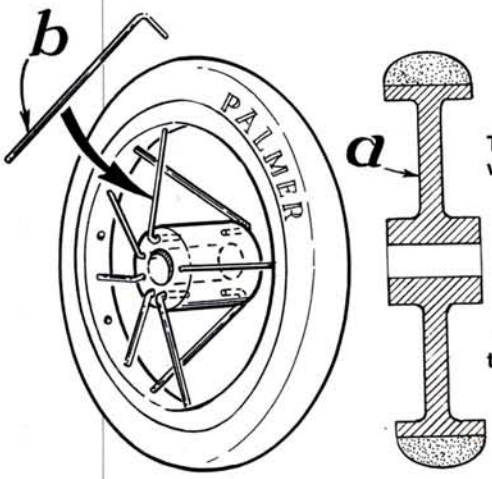




HANGING AROUND

Make space in a confined workshop by hanging model parts and shelves from nails driven into the beams and ridge board. A low fence (a) nailed around the shelves will allow them to be lifted down without the jars, etc., sliding overboard. Make the model slings out of stout cord or narrow webbing; use picture wire (b) to support heavier shelves.

Gordon J. Rae, Gt. Malvern, Worcs., England



SPOKED TRAINING WHEELS

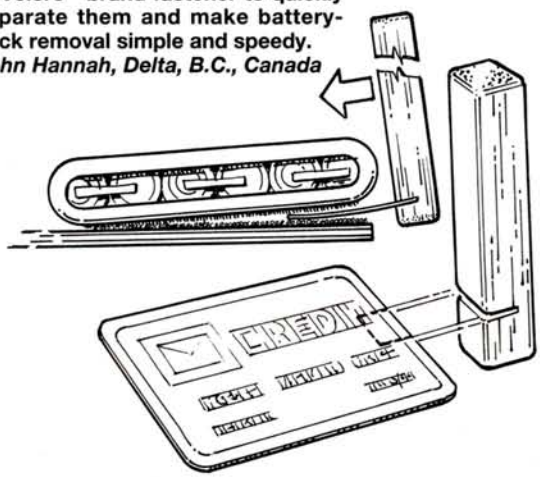
These inexpensive spoked wheels are old bicycle training wheels. Remove most of the web (a), drill holes around the rim and hub, then CA in a few coat-hanger wire spokes (b). Remove the rest of the web and add the rest of the spokes.

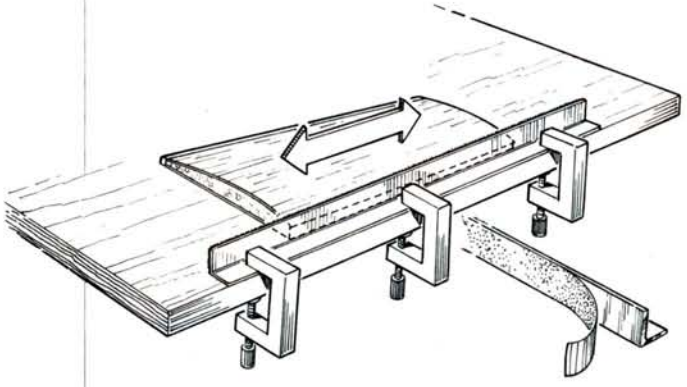
Stephen Henningson, Los Angeles, CA

PACK PEELER

Glue an old credit card into a slotted stick. This simple tool can be forced between the two layers of Velcro®-brand fastener to quickly separate them and make battery-pack removal simple and speedy.

John Hannah, Delta, B.C., Canada

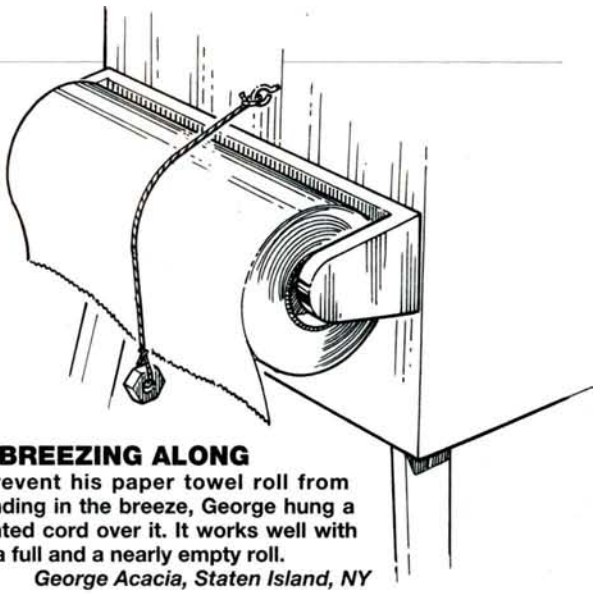




STRAIGHTEN UP AND FLY RIGHT

Clamp a sandpaper-faced, straight aluminum angle to the edge of the bench, then use it to sand straight leading and trailing edges before rounding them off where required. True models will fly right.

Don LeBlanc, Guelph, Ontario, Canada



BREEZING ALONG

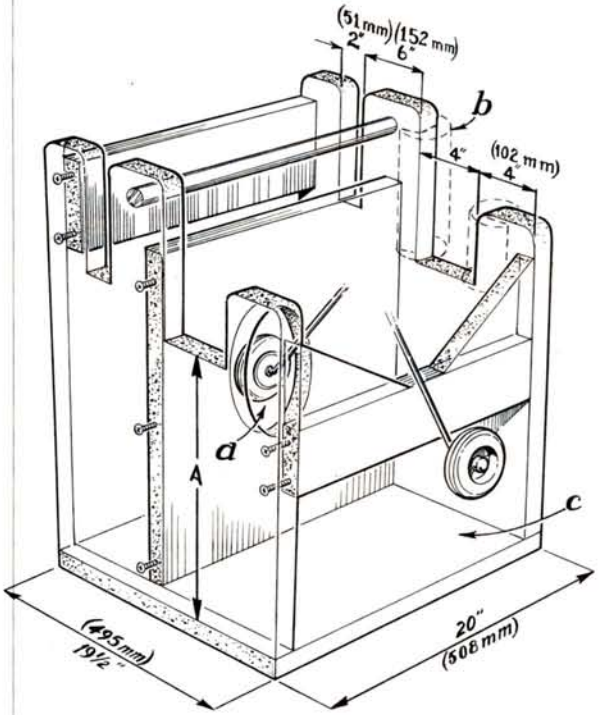
To prevent his paper towel roll from unwinding in the breeze, George hung a weighted cord over it. It works well with both a full and a nearly empty roll.

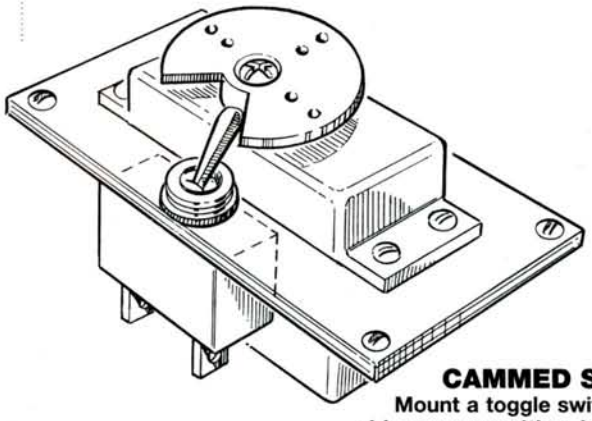
George Acacia, Staten Island, NY

CRADLE OF AVIATION

This carrying cradle is made of 3/4-inch (20mm) rigid blue insulating foam held together with dry-wall screws and latex adhesive; its handle is a 1-inch (25mm) dowel. Only the significant dimensions are shown; just be sure that the tail will clear a minivan's folded seatback (dimension A). The hole (a) is to clear the wheel. Change the diameter of the pipe insulation (b) to grip fuselages of various sizes. The one size shown easily transports a .40-size trainer. A tool tote, etc., slides into place at (c).

Don Bergstrom, Midland, MI

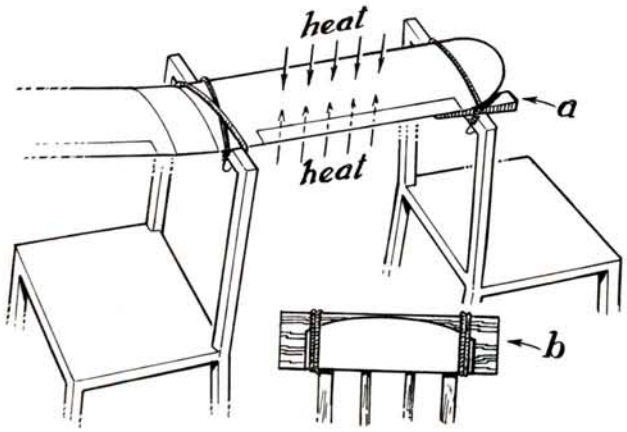




CAMMED SWITCH

Mount a toggle switch alongside a servo with a large disk. Cut out the disk as shown so that it engages the toggle and pushes it on and off. Allow about 1/64 inch (0.5mm) clearance at each end of the throw so that the servo doesn't stall and load the gears.

A. Lambousis, Columbus, NJ



THREE CHAIRS FOR GEORGE

A warped wing can be strapped across the tops of two chairs with bungees, shimmed in the required direction (a), then conveniently heated on the top and bottom and left to cool. "Eyeball" the wing for straightness. If your chairbacks are curved, just strap a board (b) across their backs, making certain it is level.

George Hodges Jr., Knox, IN

Corsair over Connecticu

by LARRY MARSHALL

Early in 1940, Lyman Bullard, Chance Vought's chief test pilot, took off from Stratford, CT, in what was to become Chance Vought's first 400mph fighter, the Corsair. With its unique bent-wing design, this plane has become something of a symbol of WW II in the Pacific. Though there was considerable concern over the ability of Corsairs to be jockeyed onto aircraft carriers, over 5,500 were eventually built by Vought, Goodyear and Brewster.

Sal Manganaro, himself a U.S. Navy aviator of the Korean War era, enlisted the aid of Eric Mey of Mey High Tech Hobbies to build a personal memorial to these great planes. Together, these two Connecticut residents have captured the essence of one of the most versatile U.S. WW II aircraft.

SAL'S CORSAIR

Sal's model used a Byron Originals Corsair as the starting point. It's of foam and fiberglass construction and weighs 29 pounds. It took Sal and Eric eight months to complete this masterpiece.

There are pneumatics everywhere to operate scale features. The canopy operates using two small Century Jet air cylinders, and it automatically opens and closes with landing-gear operation; of course, the Robart landing gear has its own cylinders. The gear doors are also operated individually using air pressure. Sal has developed an air-pressure monitoring system for the craft that's available from him at Salem Enterprises Inc., 160 Brushy Hill Rd., Newtown, CT 06470; (203) 426-3496.

The model features a McDaniels onboard lighting system, including all navigation lighting and strobes. Sal installed a smoke system, presumably to emulate a Navy pilot having engine problems (it *is* a scale airplane, after all).

One of the outstanding features of the aircraft is the cowl area. Eric has engineered a superb access method.

again!

PHOTOS BY GERRY YARRISH

SPECIFICATIONS

Model: Byron Originals F4U-1A Corsair.

Wingspan: 85 in.

Length: 68.5 in.

Weight: 29 lb.

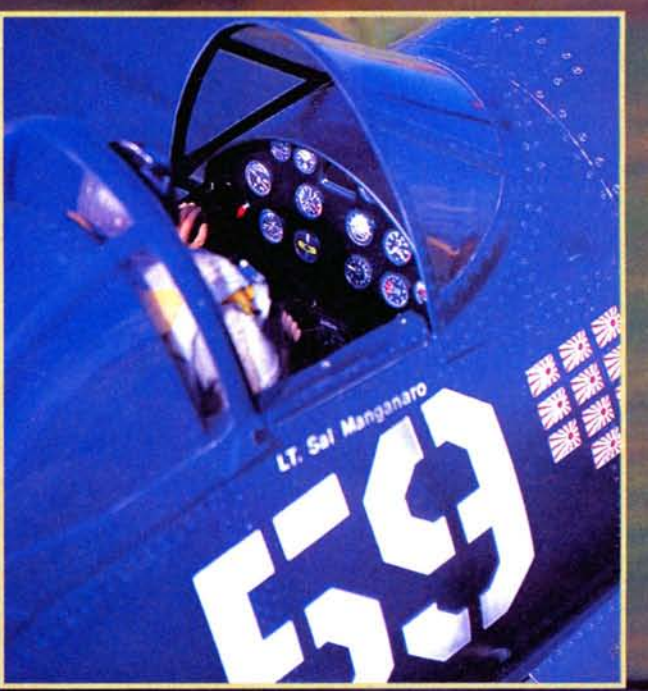
Engine: Precision Eagle Custom Sachs 4.2ci with Byron Purr-Power mount/muffler.

Prop: 3-blade, 23.5x16.

Finish: Sherwin-Williams automotive lacquer.

Radio: Futaba Super 8UAP; includes Futaba G155 gyro on rudder function.

Comments: Sal's Corsair features six-section, functional flaps, retracts with pneumatically activated doors, operational sliding canopy, smoke system, Jomar battery-backup system and operational nav lights with strobes.



The cowl is split and held in place by a custom mounting frame. The top half is easily removed for access to the Precision Eagle Sachs 4.2ci (with a CH Electronics ignition package). The installation is as functional as the engine is powerful. Spring-loaded latches open other hatches to allow access to radio, fuel and smoke systems.

But, as with any detailed scale model, the real eye-catchers are skin deep. With all rivets and panel lines modeled, the Sherwin-Williams automotive lacquer finish really causes the Corsair to come alive. The U.S. Navy markings are unique to this model yet, somehow, it just doesn't matter.

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

by CRAIG TRACHTEN

I JUST BUILT and flew my latest kit, the Pacific Aeromodel Mfg.* Sukhoi Su-26 and, to quote the immortal Jackie Gleason, "How sweet it is." This .40-size, sport-scale ARF has to be one of the best-built ARFs I've worked on (and I've probably completed 20 ARF/ARC models in the last 2½ years!). I was so impressed—especially with the fuselage finish—that I called the owner of Pacific Aeromodel, Johnson Ting, to find out how the fuse was covered. I was surprised to find out that it used Oracover. Flat, uncut Oracover is applied to the veneer and then cut to shape. The foam wing, stabs and landing gear were equally impressive. I added the optional fiberglass cowl to cap off this AAA kit.

Pacific Aeromodel Mfg. Inc.

Sukhoi Su-26

WING AND TAIL ASSEMBLY

The wing is constructed of foam-core covered with 1/16-inch balsa sheets that are covered with high-quality polyester. The ailerons and trailing edge (TE) of the wing must be slotted for hinges. CA hinges are used, so be careful not to use too much CA, as it will deteriorate the foam. Now peel off a 1-inch strip of the covering around the root of each wing half. This will give you a good surface to apply 2-inch-wide fiberglass tape to reinforce the wing halves after you've attached them with 5-minute epoxy. Spray the 2-inch balsa area with 3M 77 adhesive, lay the cloth nice and flat, then brush on finishing epoxy. When everything has dried, epoxy the aileron servo tray, wing-bolt plate and wing-mounting dowels to the wing as indicated in the instructions. I spent less than an hour assembling the wing.

To mount the wing to the fuselage, you must first construct the two wing-mounting plates. Each consists of three 1/8-inch pieces of ply that are CA'd together and have an 8-32 blind nut inserted through them. Be careful when you assemble the mounts;

PHOTOS BY DEBRA SHARP & GERRY YARROW

Quick-build aerobat

build a right and a left one. When complete, epoxy the mounts to the fuselage. After they've dried, insert the 8-32 nylon nut from the inside out. This will allow you to locate and drill the mounting holes in the wing. White plastic wing-saddle moldings are supplied and should be pressed into place on the fuselage.

As with the wing, the stabs, elevator and rudder must be slotted for CA hinges. Mark the horizontal stabilizer where it will be attached to the fuselage. Cut and remove the covering inside the marked lines, and be sure that you don't cut into the stabilizer itself. Epoxy the stabilizer into place, making sure it is square to the fuselage centerline and parallel to the main wing. Mark and remove the covering for the vertical stabilizer and epoxy it into place. Again, make sure it's in line with the fuse and square to the horizontal stab. In both cases, the instructions call for 5-minute epoxy, but I opted to use the 30-minute type; it's stronger and allows me more time to align everything correctly.

INSIDE THE FUSELAGE

This is where you really can appreciate the materials used in this kit. First, the entire bottom of the fuselage is exposed. You will have absolutely no problem with pushrod and servo installation. Every former and joint is open for inspection. The veneer used for the fuselage walls looked so good, it could have been used for furniture inlay.

SPECIFICATIONS

Model name: Sukhoi Su-26

Model type: sport scale

Manufacturer: Pacific Aeromodel Mfg. Inc.

Length: 42 in.

Wingspan: 54½ in.

Wing area: 520 sq. in.

Weight: 5 lb., 12 oz.

Wing loading: 25.5 oz./sq. ft.

Engine req'd: .40 to .46 2-stroke or .48 to .60 4-stroke

Engine used: O.S. .46-FX

Radio req'd: 4-channel

List price: $259.95

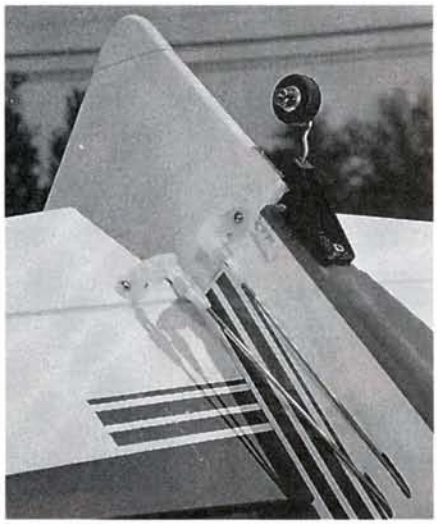
Features: all balsa and ply fuselage with vacuum-formed plastic parts. Wing is foam-core sheeted with balsa. A full hardware package is included.

Hits

- Fit, finish and materials used are excellent.
- Documentation (including photos) is well-presented and clear.
- Easy to build.

Misses

- A slight color mismatch between the reds used for the covering and the vacuum-formed plastic parts.



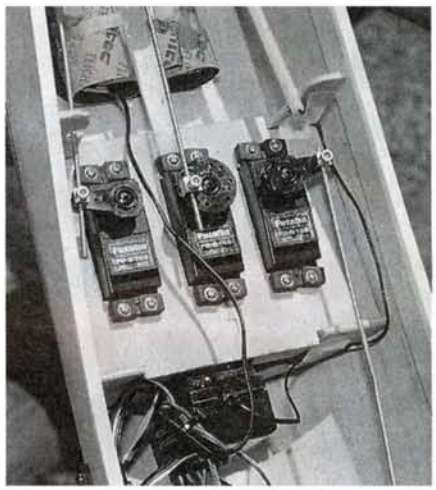
The tail feathers, showing rudder and elevator linkage—straightforward setup.

The formers and trays are made of lite-ply, and their surfaces and cut finishes are excellent. I ran a bead of medium CA over every joint, even though my inspection and twist tests showed this was probably not necessary. I'd rather be safe than sorry! With the entire bottom exposed, this was quick and easy.

The pushrods have to be made. The wires and square balsa stock are supplied. I thought that the pushrod stock should have been hardwood, but the balsa stock performed flawlessly. Installation was a snap—no fighting to find the exit holes. Epoxy the servo tray former to the front of the servo tray, then epoxy it into place in the fuselage. After it has dried, you can attach the plastic rear fuselage bottom. The instructions suggest that CA be used. I liked the ease of an open fuselage, so I screwed the bottom plate on with servo screws. If and when repairs need to be made, the bottom plate can be removed. Installing the landing gear is similar to installing the servo tray. Insert the blind nuts into the landing-gear plate, then epoxy it into place. Glue the cover plate in place with CA, and you've finished! Every piece of lumber and plastic in this kit was finely finished and fit like a glove.

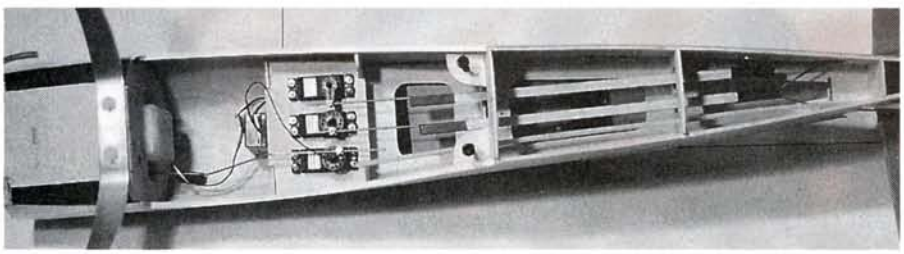
As with everything else with this kit, mounting the engine was a snap. Insert four blind nuts into the pre-drilled holes, feed the four 5/8-inch 10-32 machine screws through the mount's pre-drilled holes and tighten. You don't have to concern yourself with drilling holes to secure the engine to the mount because the supplied engine mount uses a clamp-style mounting system. Move your engine left, right, up or down for proper alignment. Tighten the mount, and you've finished.

I installed an O.S.* .46-FX in the Sukhoi. I've always had great success with this engine, and it gave me all the power I could have asked for. An APC* 11x6 prop was used for the test flights. (This prop provided the best overall performance and will remain on the model. The .46-FX turned it at 12,400rpm). I tested a new Weston tuned muffler imported by Estes*, although I did have to make an extension so the tuned muffler would exit the model properly. For the record and for those who are noise-conscious, with the .46, the APC 11x6 and tuned muffler, I got a reading of 91dB.



The servo tray is made of lite-ply and easily fits between the fuselage formers—loads of room inside.

As with all my aircraft, I used my



I really appreciated the fact that the plastic fuselage parts are left off. You can easily set up all the control pushrods and make sure everything is functioning properly before you close everything up.

FLIGHT PERFORMANCE

• Takeoff and landing

The instructions warn that the aircraft might tend to dip its left wing as the tailwheel leaves the ground but will become stable after liftoff. This wasn't a big deal; a little blip of right rudder, and the Sukhoi was airborne without incident. I climbed to altitude preparing to make trim adjustments, but none were needed. With all control surfaces neutral, the aircraft tracked true and straight. Please keep in mind that I was very careful in adjusting the CG, and the balance—wingtip to wingtip with nose/tail centerline—was also right on.

As with any sport plane, keep the airspeed up so the model won't tip-stall on landing. Fly it to the ground, and cut the throttle just before the wheels touch down.

• Low-speed performance

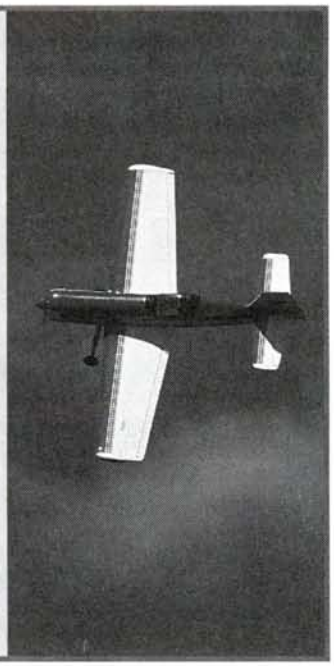
This aircraft has great low-speed performance. It will fly almost as slowly as a trainer but, of course, it's much more sensitive. If the aircraft does stall, it will nose down and break mildly to the left. Add power, input a little up-elevator and right rudder, and you're off straight and level.

• High-speed performance

With the .46, this airplane will not stall at high speed; it will go vertical forever. During the climb, I pulled back on the throttle until the aircraft stalled. The Sukhoi did a 180 and twisted to the left. Again, recovery was as simple as adding throttle and up-elevator.

• Aerobatics

To get good photos of models, we bring the outboard wingtip up to show the top of the aircraft to the camera. The best way I know of doing that is by doing knife-edge, or at least partial knife-edge, flight as low and slow as possible. So, the first thing I did with the Sukhoi was take it to altitude and fly the field in knife-edge. It performed flawlessly, with very little elevator correction. It does Cuban-8s, rolls, loops and just about anything else your thumbs and brain can conjure up just as well. This is a fun plane, and the O.S. .46 provides plenty of vertical.

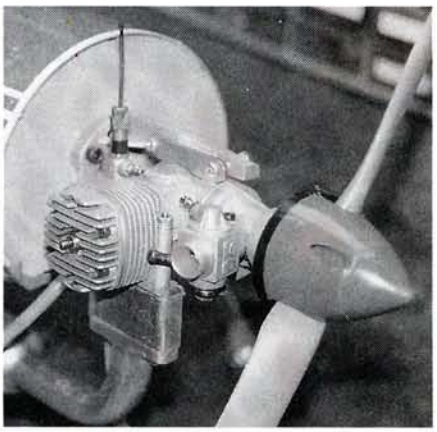


The new Weston tuned muffler from Estes in a good match for the O.S. .46-FX.

Futaba* 8UAF. Any quality 4-channel radio and standard servos would do well with this model. A radio with dual rates would be nice but isn't absolutely necessary. The 8UAF gives me ATV, exponential, dual rates and throttle cut, so setup and adjustments are ridiculously simple.

FINISHING TOUCHES

Mount the wing, then attach the belly fairing. I used CA gel for this. The kit comes with a three-piece plastic cowl, and a fiberglass cowl is an available option. It looks great and is durable. A fiberglass chin piece is also available. The only "miss" I could find in this kit is that the plastic parts don't match the covering on the model very well. The wing and markings are dark red, and the plastic parts are more of a missile red. When the model is on the flight



I used an O.S. .46-FX for power. Installation isn't complicated.

line and ready for takeoff, however, you can't notice the difference.

Cut and fit the canopy. This takes all of 5 minutes. I mounted a 2½-inch Hangar 9* sport pilot bust in the cockpit before gluing on the canopy with Pacer* Formula 560 canopy glue.

The Pacific Aeromodel Sukhoi Su-26 is a work of art. I'm so impressed with this kit, I'd have to use every cliché I can think of to describe it. If you're ambitious, you can have this model from box to field in one day.

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

5TH ANNUAL

Champlain Valley Big Bird Fly In

IMAA giant-scale fun in the Adirondacks

by GERRY YARRISH

ONE OF the most beautiful areas in northern New England is the Adirondack region. Vistas of beautiful blue lakes, mountain peaks and uncounted evergreens greet the eye at every turn. The region is a vacationer's dreamland. About an hour north of Lake George Village and just past the Olympic training facility at Lake Placid is the small town of Westport, NY. Situated on the shores of Lake Champlain, it's here that many well-informed IMAA giant-scalers congregate to enjoy the 4th of July weekend. The event causing all the fireworks is the Champlain Valley Big Bird Fly In, hosted at a private airport just outside of town. If laid-back, low-stress flying is your thing, then this is the place to spend your Independence Day weekend.

In its fifth year, the Champlain Valley Big Bird Fly In drew 171 registered pilots and over 250 models. The owner of the airport, Harry Cox, makes his hangar available to the modelers so they can house and charge their models overnight. Members of the Champlain Valley Big Bird Association—the host club—along with CD George Pilger and Sonny Allen made all the participants feel right at home. A large grassy area between the hangar and the flightline is used for the many tents, campers and motor homes that find their way to the event.

A small food concession keeps everyone well-fed, and a few hobby vendors were on hand this year to hawk their wares. Greg Namey of Innovative Model Products* set up shop and donated prizes for the pilots' raffle. Also seen helping out on the flight-

Ready to commit aviation, Jean Chevalier brought his new SkyTech Aviation 33-percent-scale Superstar. The model has a 102-inch span and is powered by a Q-65.*

Ken Hall does a nice inverted pass during the noontime show.

This beautiful 30-percent-scale Staudacher 300GS—built from an Aero Craft kit—was flown by John Kohler of Mahopac, NY. Power comes from a Zenoah G-62.

With a beautifully manicured, 2,000-foot sod runway, the 4th of July IMAA Fly In at Westport, NY, is an R/C pilot's dream come true.

Wondrous Waco

Larry Alles of Flemington, NJ, flew this very impressive 40-percent Waco YMF-5. The Waco was built from 50-percent-enlarged Jim Pepino plans.

Weighing in at 50 pounds, the 135-inch-span Waco is a handful. Here, Larry starts the 3W 120 engine while Barry Herthum holds the model back.

Larry Alles of Flemington, NJ, is well-known in IMAA circles for building truly big aircraft. Larry's latest project is his impressive 40-percent-scale Waco YMF-5. As can be seen, the Waco is a handful. Larry took Jim Pepino plans and had them blown up 50 percent, and the wingspan came out at 135 inches. The model's weight is 50 pounds.

The Waco is covered with SuperShrink Coverite and painted with automotive acrylic enamel with a clear coat applied overall. The model is complete with rigging wires, turnbuckles and rib stitching, and it took Larry about a year-and-a-half to build the model. The engine is a 3W 120 B2 twin-cylinder turning a Menz 32x10 prop. Larry also included a smoke system to help show off his monster during his noontime show.

Larry doesn't just come out and fly the big Waco around in circles, he puts on a low-level, scale, aerobatic demo. Wing-overs, loops, rolls and inverted flight are all in the Waco's flight routine. To date, Larry has 150-plus flights logged with the Waco. Can there be any doubt that Larry thinks, "Bigger is better"?

Precision landing? Actually, this pile-up was how members of the PIK show team—Ken Hall (bottom) and Dave Jaggie (top)—ended up after their formation-flight demo; no damage.

Below: Barry Herthum flew this Ziroli-designed Ju-87 Stuka divebomber. The bent-wing warbird has an air-driven siren and is powered by a Zenoah G-62.

Nick Ziroli Sr. flew his impressive Douglas Skyraider and demonstrated its fast and slow-speed handling characteristics. Nick even did slow, inverted flybys at almost Cub speeds.

Janet Ziroli wheels Nick's Skyraider into the pits after another excellent flight.

CHAMPLAIN VALLEY BIG BIRD FLY IN

This unusual Beechcraft PC-9 Mk II was flown by its designer, Gilles Paradis of Paradise Originals*. The 22.5-percent-scale model has a 91-inch span and is powered by a Q-42 gas engine.

George Buso (Rhinebeck Jamboree organizer) fires up his beautiful Proctor Nieuport 28.

line and generally getting into trouble in the pit area was Gary Madden of Madden Models*. Air-Tees was also on hand with silk-screened T-shirts for the aviation-minded. Owner "Spanky" MacKay also helped out behind the microphone, along with Bill Steffes and Scott Foster. For the most part, this event has the feel and spirit of a local club get-together—no pressure, tension, or trophies.

On the flightline, flyers pitted themselves against one another to see who could have the most fun. Flying starts promptly at 9 a.m. and lasts till 5 p.m. After 5 p.m., the field is available for open flying and anything goes. From scale ducted-fan jets to 3-channel, Duraplane instruction, the modelers just keep on flying until they can't see their planes for the darkness. I did hear a rumor, however, that the airport's large spotlight was used to allow some intrepid flyers to use the field well past nightfall; only one model is known MIA! During the noontime airshow, many of the pilots flew demos, to the delight of the general public. Lasers, Extras and Staudachers executed IMAC-style acrobatics while formation flights of WW II heavy-metal warbirds showed the crowd what our hobby is all about. There was a little bit of everything; from a ¼-scale electric Cub and a B-17 bomber powered by electric motors to a gigantic 40-percent-scale Waco YMF-5 biplane. The halftime show was one of the best to be seen. Following the airshow, all the models were lined up on the centerline so the public could get a closer look. With public relations being such an important part of our hobby's growth, events such as Westport make a great contribution to our future.

The Champlain Valley Big Bird Fly In is a great excuse for any IMAA modeler to head off to the Adirondacks. With many small motels, campsites and "bed-and-breakfasts" only minutes away, the entire family can enjoy the weekend. Just don't expect a lot of expensive, five-star hotels; this is laid-back, "country inn" living at its best. Be prepared to relax.

For more information on the Champlain Valley Big Bird Fly In, contact George Pilger, Box 137, Ol Furnace Rd., Moriah, NY 12960; (518) 546-7843; fax (518) 546-7757.

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

This impressive 40-percent-scale Aeronca Sedan was for sale at the fun fly. Impressive workmanship.

Coming in for a landing, Bill Steffes' Great Lakes Special easily handles the crosswind. Powered by a Q-42, the biplane has a wingspan of 72 inches. The model was built from* Model Airplane News *plans (FSP05891).

The youngest pilot this year was Paul Sitler, who flew a Lanier Stinger 120 powered with an O.S. .91 engine. Watch out, Chip Hyde!

NEPRO Q500 RACING

by RICK BELL

Go fast; turn left!

Left: a plane being held up for identification by the judges. Above: Billy Glode launching a Quickie. Background: Chuck French and Lewis Schwab duel it out.

THIRTY-FOUR ENTHUSIASTIC pilots converged on the Central Connecticut Radio Control Club (CCRCC) in Farmington, CT, for their annual NEPRO Quickie 500 race. CCRCC has been putting on this race for twenty-something years (nobody remembers exactly how long!), and it has become one of New England's premier Q500 races. Contestants this year came from Massachusetts, Rhode Island, New York and Connecticut.

What is NEPRO? The NorthEast Pylon Racing Organization is a group of dedicated people who support R/C pylon racing under the safest conditions possible and all-out competition. This racing can be considered the "IROC" of Q500 racing, as all the aircraft are very closely matched so that piloting skills, not who can buy the most horsepower, will prevail.

Several Quickies being prepped for launch.

"How is this done?" you ask. Easy! All planes are built to the same standards. Wings are of a constant chord and minimum thickness; fuselages are also of a minimum cross-section at the wing chord and can not have wing fillets. The planes can not weigh less than 3½ pounds without fuel. The only engine allowed (with no modifications) is the K&B* 4011 (.40 size) with either the stock carburetor or a NEPRO-approved Varsane* carburetor. Stock K&B mufflers must be used. Also, no cowling or streamlining around the engine is permitted. Propellers used are either APC* or Master Airscrew* 9x6. The host club supplies the fuel for all contestants for the event. Using these requirements makes for some very close and exciting racing.

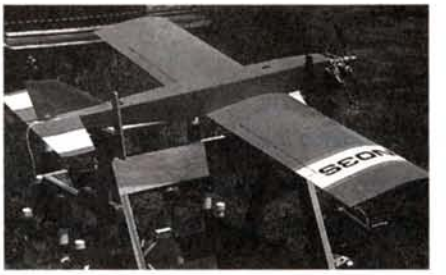
As in past years, two classes were run—standard and expert. Standard is for pilots just starting or whose times are 1:40 and over. Expert is for pilots whose times are under 1:40. If you race in standard and for two heats have times less than 1:40, at your next event, you move into the expert class.

To put on a first-class event, you need a first-class contest director and volunteers. Pete Reed has been the contest director for this event many times and knows how to keep things moving. This year, there were 14 pilots in standard and 20 in expert. Five rounds consisting of 45 heats were flown under ideal weather conditions. The racing was very good with many neck-and-neck heats. Some were a little too close, as those involved in midairs will tell you. For some unknown reason, pylon number three was a magnet for the racers, as three of them got just a little too close and didn't quite make it around the pylon. Dick Thomas was very thankful for the safety cages! After the dust (and some of the pieces) had settled, a fly-off for first and second was needed in expert and a fly-off for second and third in standard. In expert, Lewis Schwab came out on top over Lloyd Burnham. In standard, Bob Triggs topped Frank Heil for second place, but it was Michael Luzzi who took all the marbles in standard class. At the awards presentation, NEPRO gives out "heat" money. If you win a heat, you get a dollar—a nice touch.

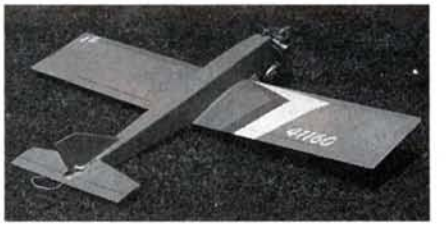
Wayne Russell fueling Steve Pastula with Powermaster fuel.

PHOTOS BY KICK BELL

NEPRO Q500 RACING



Clockwise from top left: Rob Settembro's Infinity; another popular Quickie is the Vector 500 (this one is owned by Vance Sutton); Cosmo Pertrone from Carmel, NY, flew this Pacemaker; this Intimidator is by Michael Luzzi of New Haven, CT.



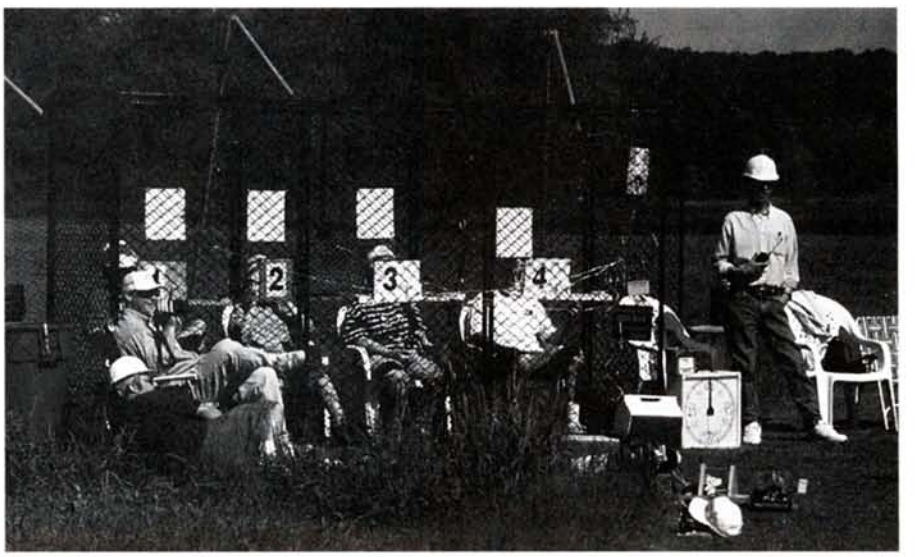
Contestant List and Standings

STANDARD CLASS	EXPERT CLASS
1. Michael Luzzi	1. Lewis Schwab
2. Bob Triggs	2. Lloyd Burnham
3. Frank Heil	3. Raymond Dolat
4. Don Morgan	4. Tom Rebenklau
5. Cosmo Petrone	5. Dennis Sawyer
6. Chuck French	6. Bob Wallace
7. Russ Levy	7. Richard Berner
8. Mike Stewart	8. Steve Dombek
9. Wayne Galbraith	9. Bill Jensen
10. Frank Gorham	10. Michael Masi
11. Ed Poccia	11. Paul Zink
12. Don Kilgus	12. William Glode
13. Rob Settembro	13. Arnie Wile
14. Dennis Thibodeau	14. Bob Davis
	15. Allen Reinhardt
	16. Dave Doyle
	17. Kevin Cyr
	18. Don McStay
	19. Steve Pastula
	20. Vance Sutton

Of course, no event could be run if it weren't for the many dedicated individuals who give their time and efforts. CCRCC has one of the best crews, and to recognize them, a workers' raffle is the last item on the agenda. All the workers go home with some goodies. In conclusion, this year's race was a winner for all those involved. See you there next year!

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

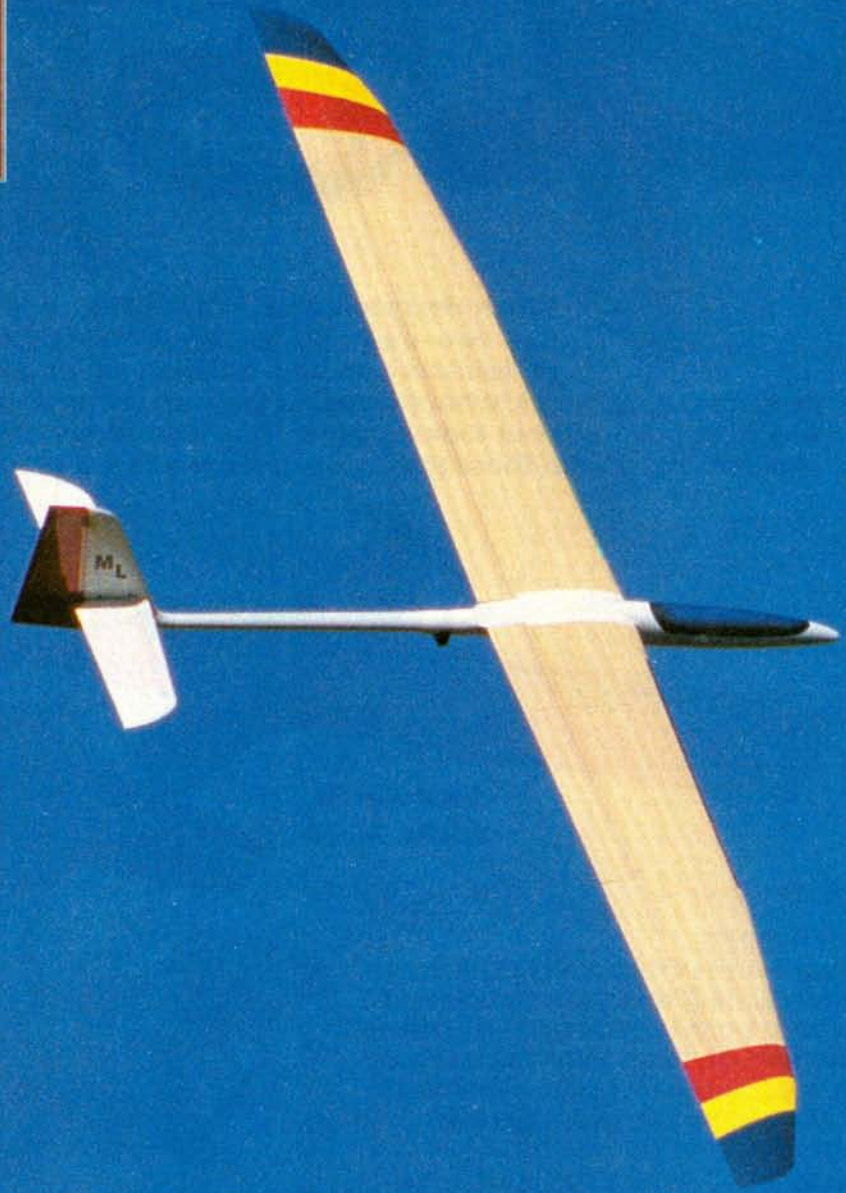
The crew who did all the hard work of putting on the event.



This is one of the pylon judges' cages (photo taken during one of the breaks).

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW



Whyte Wings

SAPPHIRE

AN OPEN-CLASS GEM

by MIKE LEE

THE OPEN-CLASS Whyte Wings* Sapphire is a thoroughbred sailplane that was designed with one goal in mind: thermal duration performance!

Sapphire starts with a 118-inch-span obechi-sheeted wing with 975 square inches of area. The planform has a triple-taper leading edge (LE) with a straight trailing edge (TE), all mounted to the tried and true SD7037 airfoil. Special attention has been given to keeping the weight of the ship down. The wing rod and joiner tube are made of carbon fiber. The joiner is a high-compression molded rod that's fitted to high-strength, carbon-fiber tubes in the wing. This assembly alone weighs over ¼ pound.

Virtually all the hardware needed to hook up and seal all flight surfaces is included. Whyte Wings provides hinging tape and gap-sealing tape; fiberglass control horns; a heavy-duty tow-hook with block and blind nut; a sanding block; blueprint drawings and some of the best instructions for a model kit found anywhere.

WING AND TAIL ASSEMBLY

Glue the LE stock and wingtips to the sheeted cores. This goes rapidly with the help of masking tape. The fairly large ailerons and flaps are still attached to the wings and only need to have their ends cut to free them from the wing. Glue the LE and TE stock to the flaps and ailerons.

After the wing edges have cured, sand everything down. You'll need to bevel the LEs of the flight surfaces for proper deflection, and then you can install the servos.

Servo wells and a "wire way" have already been cut out for you in the wings. I used a length of thin piano wire to reach the aileron servo cutout and then pulled the wire back to the wing root. You'll need to have servo extension wires for this plane. I used Airtronics* 94141 servos, which are a perfect fit in the servo wells and are strong enough to handle the loads. You'll need two servos for the ailerons and two for the flaps. A dab of 5-minute epoxy holds them in place. (Don't worry; they'll pop right out when you need them.)

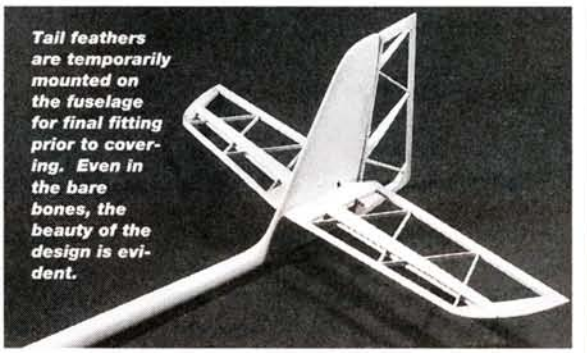
The tail surfaces are totally built up. This is a change from previous Airtronics high-performance planes and saves weight. The airfoil here is almost a diamond shape, owing to the near I-beam design of the spar section. It's strong enough to withstand harsh launches.

Although the vertical stabilizer is molded into the fuselage, the rudder is completely built up in a typical geodetic design. Like the horizontal stab, the rudder is larger than usual. Control horns for both the rudder and the horizontal stab/elevator are inside the fuselage. The flying stab is a two-piece affair and is joined with carbon-fiber rods slipped into carbon-fiber tubes.

At this point I should tell you what surface throws I used on the Sapphire:

Elevator: 5/8 in. up; 5/8 in. down.
Aileron: 1 in. up; 3/8 in. down.
Rudder: 1.25 in. left and right.
Flaps: 90° max. down; 5° max. up.
Mixing: 100% aileron to 40% rudder; 100% flap to 35% down-elevator; 2-channel aileron mix; 2-channel flap mix.
Camber mix: flap to ailerons @ 20° max. down.
Crow setting (@100% down flap)**:** -30% down-elevator; -10° up-aileron.
Launch setting: 20% flaps down; 15% ailerons down.
Reflex mode: 5° flaps up (approx. 3/32 in.); 5° ailerons up.

As you can see, to derive the full benefit of this ship, you'll need a computer radio that's capable of the mixing circuits I have described above. My Airtronics Stylus 8-channel PCM fit the bill easily. With pre-programmed software to handle sailplane mixing, setup was swift and easy.

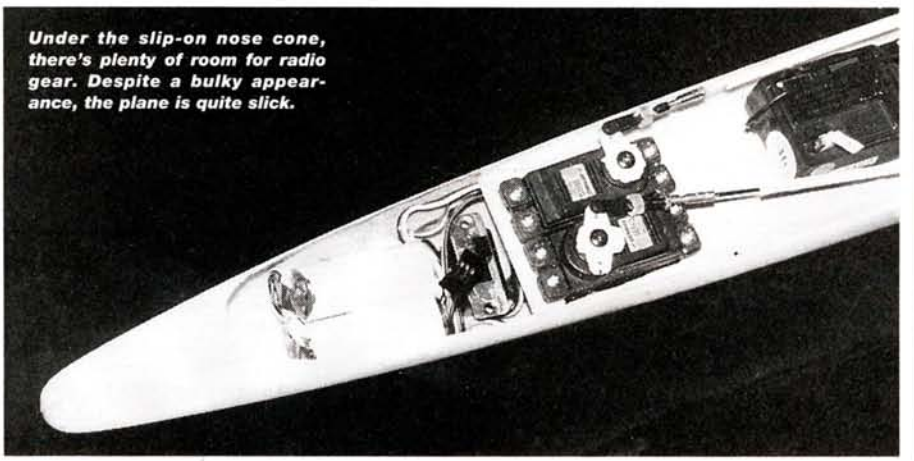


Tail feathers are temporarily mounted on the fuselage for final fitting prior to covering. Even in the bare bones, the beauty of the design is evident.

FUSELAGE SETUP

The fuselage is fiberglass with Kevlar reinforcement. Once of the real treats in this kit is that the pushrods are carbon-fiber rods already mounted in the fuse!

At the nose, a plywood servo tray is shaped and epoxied into place. I highly



Under the slip-on nose cone, there's plenty of room for radio gear. Despite a bulky appearance, the plane is quite slick.

PHOTOS BY MIKE LEE

Author/builder Mike Lee hooks up the Sapphire to the winch prior to launch.

SPECIFICATIONS

Name: Sapphire

Manufacturer: Whyte Wings

Type: open class thermal duration sailplane

Wingspan: 118 in.

Airfoil: SD7037

Weight: 66 oz. ready to fly

Wing area: 974 sq. in. (advertised); 1,004 sq. in. (review model)

Wing loading: 9.46 oz/sq. ft. (review model)

Length: 57 in.

No. of channels req'd: 4 (elevator, aileron, rudder, flaps). Does not include mixed channels for crow, camber and reflex settings.

Price: $369

Features: fiberglass/Kevlar reinforced fuselage with slip-on nose, .sheeted obechi over foam wings, carbon-fiber wing rods and tubes, carbon-fiber stab joiners and pushrods. A lot of hard work already done by the factory. Complete hardware package.

Comments: an outstanding new aircraft for thermal duration flight, this ship does it all and does it better than the competition. Its wide flight envelope allows versatility for intermediate and expert pilots.

Hits
- Very high-quality workmanship throughout.
- Hardware outfit has virtually everything.
- Excellent flying characteristics.

Misses
- Wing root and fuselage shoulder sizes did not match.

FLIGHT PERFORMANCE

• Takeoff and landing

The first flights were done off a 12V winch with the aircraft flight surfaces set for launch mode. The launch is quite steep, yet solid and straight as an arrow up the tow-line. The best part of the launch is performing a "zoom" at the top, and the Sapphire does an outstanding zoom, resulting in towering launches with little effort. Landing the Sapphire is pleasant, as it slows quickly with crow. You can maintain a constant 15 to 20 degrees of nose-down approach without building up any speed as you head for the landing spot. With just a touch of up-elevator, Sapphire flattens out over the spot and settles; this will gain you points in competition.

• Low-speed flight

With just a tad of camber from the TE, Sapphire will simply hang in the sky. All flight controls remain solid, and the model shows no tendency to stall. With full crow setting, Sapphire will come to a screeching halt when the nose is leveled. The flaps perform well as air brakes when asked. Thermalling is excellent, as the Sapphire circles well with little need for constant attention. You can stand the model up on its wingtips in tight circles while coring a small thermal with confidence. Thermal climbs are good with efficient acceleration through lift.

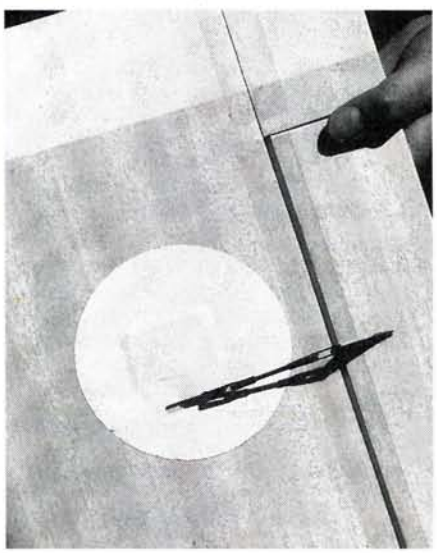
• High-speed flight

Two areas in which every sailplane is asked to go fast are during launch and when covering sky. On launch, the Sapphire maximizes towing speed for altitude by performing a terrific zoom launch. When it's moving across the sky, you need add only a bit of reflex, and the Sapphire will take off quickly. It's a bit more sensitive on elevator during high-speed flight, so your control inputs have to be smooth. Otherwise, you can definitely cover sky with this ship.

• Aerobatics

Sapphire isn't an aerobatic aircraft, but it will perform basic loops and rolls as well as any sailplane. It has solid aileron response and very good pitch control. About the most exciting aerobatic stunt the Sapphire is capable of performing is a good spin; you really should stick to thermal duration flight with this plane.

recommend that you use epoxy, as this adds a lot of strength to the nose area—especially useful when nosing the plane into a spot landing. I also found that a slip-on nose cone adds strength without adding weight. There's a lot of room in the nose for radio equipment, so the rudder and elevator servos can sit side by side. I used an 800mAh Sanyo* pack to power the six Airtronics servos on board. Although a typical open class plane may need up to 6 ounces of lead to balance, the Sapphire needed only ½ ounce!



A look at the covered aileron servo shows a clean installation. The round servo cover is supplied with the kit.

It's time to mate the wing and tail assemblies to the fuse. I ran into my only problem with the kit here: the set of wings did not match the fuselage at the wing root; the wings are ¼ inch wider than the shoulder of the fuselage. To correct this, I added filler to the LE of the shoulder and sanded it to shape.

FINISHING

To initially seal the wood and fill the grain, I applied a mixture of Varathane Satin finish and baby powder. A final coating of Varathane Satin gave the wood a nice surface. The fuselage was finished with Coverite's* 21st Century paint and primer and white finish coat, and I used 21st Century film on the tail. All-up completed weight, ready to fly was 66 ounces. This equates to a 9.46 ounces per square foot of wing loading—pretty darn good! (Note: my calculations were based on my measured wing area of 1,004 square inches, compared with the specified area of 975 square inches.)

FINAL THOUGHTS

The Sapphire was designed to maximize the overall launch capability and reduce induced drag while keeping weight to a minimum. Its long tail moment keeps the pitch movement smooth, while its large ailerons maintain a crisp rolling response.

Overall, this is a very surprising aircraft to fly. Its average looks belie its outstanding performance range and, because it's so easy to build, it should win over a lot of pilots. Whyte Wings has a real success with the Sapphire; I rate it a "10."

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

About the author

Mike Lee is a thermal sailplane aficionado from Redlands, CA. He felt so confident with the Sapphire that he immediately competed with it at a local club contest. Mike says that although he didn't win the class, he was very competitive and is sure that he'll be winning with the Sapphire in the near future.

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

SMALL PLANES, BIG FUN

The Fokker is a nice small-field flyer.

Hobby Lobby Intl.

Démant & Fokker

by LARRY MARSHALL & GERRY YARRISH

The Speed 400 craze is still heating up. It seems that if an aircraft type exists, someone is trying to fly one with one of these little motors. But most of the planes being flown are either built from plans or from one of the few Speed 400 kits on the market. What's a guy to do if he just wants to give small electrics a try, with minimum effort?

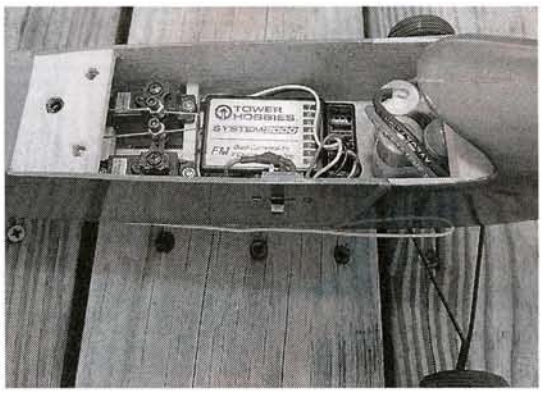
Hobby Lobby* has come up with a couple of answers to that question in the form of two Czech-built ARFs. The Fokker, a small sport plane, features a plastic fuselage and a pre-built, traditional balsa wing. The Démant is all balsa and ply and it, too, comes in an almost-ready-to-fly form. Both can get you in the air fast and let you start using that field down the street from your house for some good flying fun.

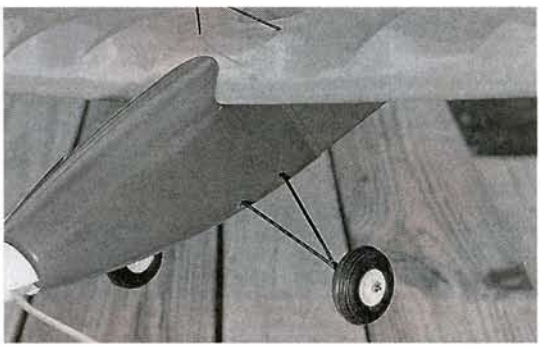
Gerry Yarrish holds his Démant—a nice calm-wind flyer!

CONSTRUCTION

• **Fokker.** I built the Fokker while Gerry went to work on the Démant. I found the Fokker to be very straightforward, with very little true construction required. To "construct" the wing, you mount the wing-mounting bolt reinforcement, and you're done. There is nothing to the fuselage assembly other than to glue the tail feathers on and stick the wheel struts into the pre-drilled holes in the fuselage.

Radio installation consists of the standard mounting of two microservos, mounting control horns in the rudder and elevator and running the control rods between the horns and the servos. The control rods are 1/16-inch piano wire, and the tubes they run through are installed by the manufacturer. I mounted the switch on the side of the plane. A bit of Velcro®-brand fastener was used to hold the receiver in place, and the radio installation was complete.

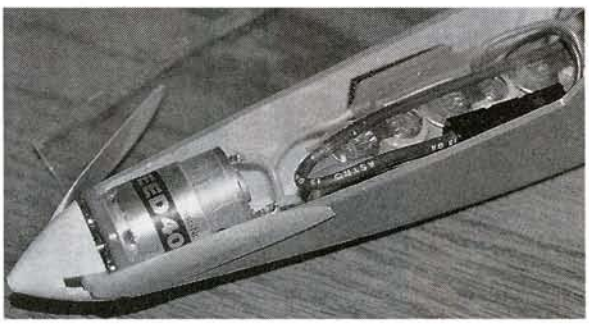


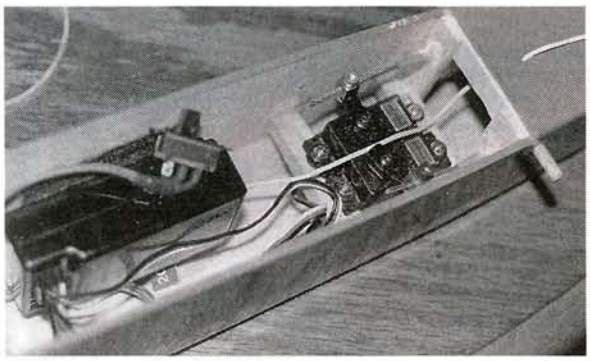


Top: radio installation is easy, as the Fokker has plenty of room. Bottom: the removable wheels plug into pre-installed mounts.

I used a JETI 10 Compact ESC. This is bolted onto the back of the Speed 400 motor and makes motor system installation very easy. I installed a 1/16-inch plywood platform for the power system battery in the nose area, over the wheel mounts. This forward location was necessary so that the battery's weight would balance the plane properly. Since the controller has a BEC, there is no need for a receiver battery.

That's all there is to it; it's ready to fly. Total assembly took me one evening.





PHOTOS BY WALTER SIDAS

Above: the power system for the Démant sailplane fits nicely under the clear plastic canopy. The 7.2V Speed 400 and Graupner 6x3 folding prop give about four good climbs to altitude. Below: a standard receiver and microservos fit easily within the Démant fuselage. I used a Tower 3000 radio system.

• **Démant.** Larry is the electrics "guru" around the office, but I much prefer gasoline-powered models. The Démant was, therefore, a big departure from my regular modeling endeavors. But I found working on the factory-built, 63-inch-span motor-glider a delight. The fuselage comes completely built, including a clear plastic canopy that is already cut to size and taped into place. The only construction necessary was to glue the horizontal stab onto the top of the vertical fin (T-tail) and install the radio and motor system. The rudder and elevator come already hinged (taped) into place and only require control horn installation.

The flexible pushrod housings for the elevator and rudder come already

SPECIFICATIONS

Name: Démant
Distributor: Hobby Lobby Intl.
Part no.: HLCO6810
Type: ARF electric sailplane
Wingspan: 63 in.
Length: 33.5 in.
Wing area: 380 sq. in.
Weight: 23 oz.(with 7-600AE cells)
Wing loading: 8.7 oz./sq. ft.
Motor used: Graupner Speed 400
Prop used: Graupner 6x3 folding
Radio req'd: 3-channel (throttle, elevator and rudder)
Price: $128
Features: handmade in the Czech Republic, the Démant ARF has all balsa and ply construction and can be ready to fly in about 2 hours. The wing comes in halves and is joined with a wire joiner and tape.
Comments: the Démant is a nice little "keep-in-the-car" kind of model that can be flown in limited flying areas. It's a bit pitch-sensitive, and a dual-rate or ATV-equipped radio is recommended.

Hits
• Short building (assembly) time.
• Strong construction.

Misses
• T-tail construction is prone to damage during transport (fiberglass tape or balsa tri-stock reinforcement to fin/stab joint recommended).

Name: Fokker ARF
Distributor: Hobby Lobby Intl.
Part no.: HLCO6210
Type: ARF electric sport mono
Wingspan: 38 in.
Length: 29 in.
Wing area: 251 sq. in.
Weight: 19.7 oz. (with 8-600AE cells)
Wing loading: 11.3 oz./sq. ft.
Motor used: Graupner Speed 400
Prop used: Graupner 6x3 folding
Radio req'd: 3-channel (throttle, elevator and rudder)
Price: $128
Features: the Fokker is balsa/ply construction and comes completely covered. In less than 2 hours, it's ready to fly.
Comments: this is a great small-field flyer. It's docile enough that anyone with some flying experience should be able to manage it.

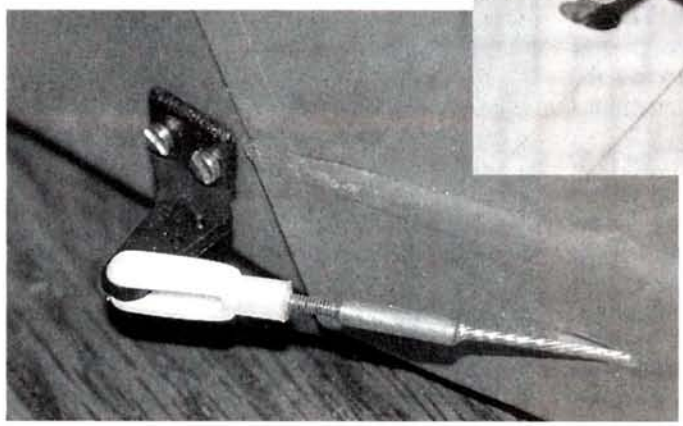
Hits
• Very short construction time.
• Sturdy model.
• Removable wheels.

Misses
• No battery platform provided.

installed; the elevator pushrod exits the top of the vertical fin. Installing the horizontal stab requires that you drill a hole in the stab just forward of the elevator hinge line. In my model, I found that there was just a bit too much friction in the elevator pushrod setup for my taste, so I replaced the inner pushrod with flexible steel throttle cable. This setup works well and is almost completely friction-free.

The wing comes in halves, and you join the panels with a wire dihedral brace and tape. No glue is required. This makes the finished model very compact for transportation. All you have to do is install the wing-hold-down dowels in the fuselage and rubber-band the wing into place.

I installed a Tower 3000 radio system in the Démant and used microservos for elevator and rudder control. The Speed 400 motor and folding Graupner prop are very easy to install, and it takes about 2 hours to get the Démant ready to fly. The only modification to the fuselage was to remove the bottom support from the forward bulkhead so the drive battery pack would lie flat on the bottom fuselage sheeting.



Left: I replaced the stock plastic pushrods with steel throttle cables for an almost friction-free installation. The plastic clevis and threaded coupler come with the Démant kit.

The elevator is controlled with this special elevator control horn included in the kit. A hole has to be drilled in the stab just forward of the hinge line so the pushrod can be connected to the horn. Here I used a Du-Bro* Quik Connector.

CONCLUSION

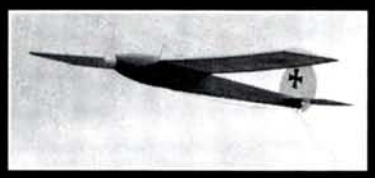
If you're looking for a way to get some Speed 400 electric experience but don't have the desire or time to build from a kit or plans, these two ARFs from Hobby Lobby might just be the ticket to get you started.

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

FLIGHT PERFORMANCE

Démant

Flying the Démant with the 7.2V Speed 400 motor and Graupner 6x3 folding prop is a real pleasure. I have, on several occasions, flown the little powered glider in strong winds and it performs surprisingly well. I do, however, recommend that you use a radio with dual rate or ATV adjustments, as the Démant is very pitch-sensitive. On calm, undemanding days, you can easily catch small thermals and stay up as long as the bubbles of warm, rising air allow. With 7-600AE cells and the Jeti JES 10 ESC, you can get at least four good climbs to altitude to search for lift.



Fokker

We fly the Fokker with a 7.2V Speed 400 and 8-600AE cells. This setup provides mild aerobatic performance and durations around 5 minutes with a Graupner 6x3 folding prop. It's just the ticket for flying from a baseball diamond, in a park, or just about anywhere that you can't fly your big birds. It will loop, snap and fly inverted, but mostly, it's just fun to fly around so you can admire it.

TOWER 3000

Often, when people consider flying small airplanes, the thing that keeps them away is the need for specialized radio equipment. Smaller planes typically require the use of microservos. Tower Hobbies makes its Tower 3000 radio available in such a way that you can buy exactly what you need. Thus, it's an ideal way to solve this problem because you can select which flight system you want to buy.

To fly the Fokker and Démant, we used a Tower 3000 transmitter. This transmitter is very similar to the Futaba 4-channel Conquest series radio. It provides servo-reversing and buddy-box capability, but not dual rates.

For the flight system, we selected their "micro" package, which consisted of a Tower 3000 receiver, a switch, and two microservos. These worked great in both planes. As both planes had BEC controllers, we didn't use the flight battery that comes with the system.

MODEL AIRPLANE NEWS

FIELD & BENCH REVIEW

KYOSHO Nexus Legato

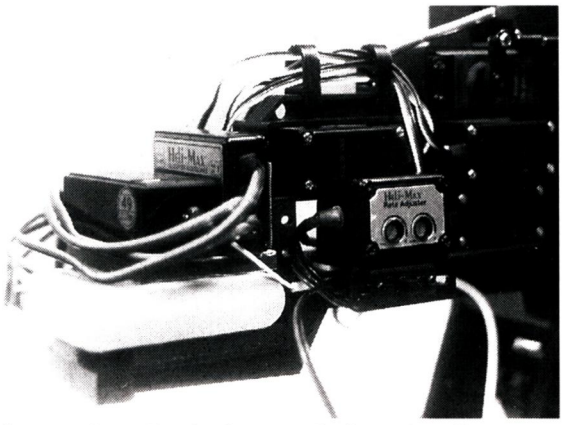
by JOHN BEECH

KYOSHO*, already well-known in the helicopter fraternity for their popular Concept and Nexus designs, has come up with another winner. The Legato, a version of the Nexus, is a pre-built ARF heli that features a powerful, factory-installed O.S. Surpass .52 4-stroke with a Hatori exhaust. Was I interested? "Well, yes ... but how much?" I really wanted this thing. Would you believe a list price of $800 or so for the package? I whipped out the charge card and, cackling with glee, rushed home with the object of my desires (the Legato) in my arms. Let me tell you what I discovered.

ASSEMBLY

• **Landing gear.** I begin assembly by putting together the landing gear. Screw the legs to the main frame, slip the tubes into the plastic legs, screw in the four setscrews to prevent them from rotating, add the tube caps, and you've finished. Elapsed time: 4 minutes.

• **Head.** I removed the assembled head from the box. Even the paddles have been installed and aligned. Place the head on the main shaft, attach the bolt and tighten it securely. Elapsed time: 7 minutes.

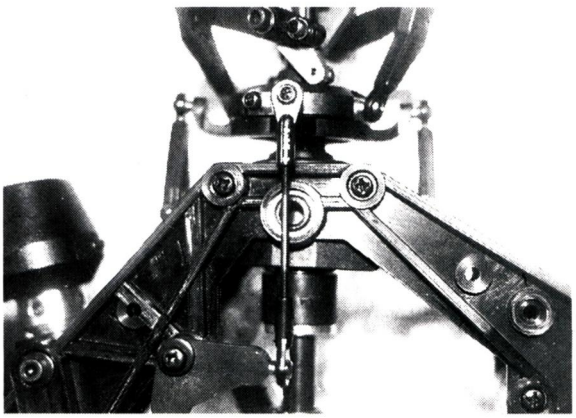


Compared to a Kyosho Concept, the Legato's radio setup is a little different. I used a Heli Max gyro.

• **Main rotor blades.** These 53cm blades are constructed of a hardwood leading edge and balsa trailing edge and come covered in white heat-shrink tubing. A bit of lead has been installed out near the tips to move the CG of the blades to the desired location and increase inertia for autorotations. I checked the balance, and they're very close. A bit of tracking tape, and they were ready to be attached with a 4mm bolt. The molded relief on the blade grip that holds the nylon locknut is a nice touch and means I needed only a hex-head driver to install the blades. Elapsed time: 15 minutes.

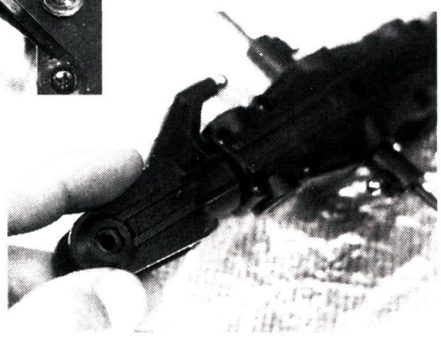
• **Tail assembly.** The tail rotor (T/R) gearbox and blades have all been factory assembled and installed on the boom. I carefully looked over the assembly. Next, I removed the drive shaft setscrew and added Loctite (I didn't need to, but it's better to be sure about these things). All that's left is to make up the tail-boom braces, which need to have their plastic tips installed. It takes but a minute for all four ends to be fastened in place. I plugged the boom into the main frame assembly—no aligning headaches, as the boom aligns itself as it goes in. I then installed the horizontal stabilizer and the boom steadied. Elapsed time: 27 minutes.

• **Radio installation.** The Futaba 6XH comes with S-3001 ball-bearing servos, a 1,000mAh battery and a trainer system, and it's easy to program. When installing the servos, I took special care not to crush the rubber grommets, which provide the necessary isolation from vibration that's critical for the longevity of the servos. With the radio on and the transmitter control sticks centered, I selected the servo arms carefully. This step is critical because the servo arms *must* be at a 90-degree angle to the linkage rods to keep unwanted differential out of the setup. Next, I assembled the pushrod ball-link ends. Elapsed time: 2 hours, 17 minutes.



Minor adjustments were needed to set up the pitch; 10 degrees is a good place to start for the high end. Since it's ARF, there's not a lot of work involved in building the Legato.

• **Gyroscope.** The gyroscope main body is mounted on a neat little platform at the rear of the model, just above the fuel tank and below the main shaft. This is a prime location that can't be used on many models because of engine vibration. I attached it with Zeal, a green, jelly-like, anti-vibration mounting sheet, instead of the supplied sticky-back foam. Although I can't vouch for its greater isolation properties, I've found that, over time, the foam tape can dry-rot or become fuel-soaked. I used a dual-rate Heli-Max* gyroscope. Initial settings were 70 percent for normal (hover flight) and 50 percent for IDLEUP (forward flight). Elapsed time: 2 hours, 25 minutes.



A nice touch on the pre-assembled rotor head is this molded relief that holds the blade attachment's locknut.

• **Pitch settings.** The manual recommends +10 degrees of pitch at the high end, and I've found that's close enough to start. If you follow the "rule of 90" when setting up the tail rotor servo linkage, the helicopter will hover just fine at about +6 degrees of pitch. I deviated from the recommended 0 degrees of low-end pitch; although that's fine for a beginner who's learning to fly, -4 degrees works better after you've become proficient. Elapsed time: 2 hours, 50 minutes.

PHOTOS BY JOHN BEECH

SPECIFICATIONS

Model name: Nexus Legato

Manufacturer: Kyosho

Type: helicopter (collective pitch)

Rotor span: 49 in.

Blades supplied: symmetrical, heat-shrink-covered wood

Height: 17 in.

Length: 45 in. with blades stowed; nearly 60 in. with all blades extended

Weight: 7 lb., 4 oz.

Engine: O.S. .52 Surpass (supplied)

Radio req'd: 5-channel

Gyro req'd: single rate

Gyro used: Heli-Max dual rate

List price: $849.99; $249.99 (Legato conversion kit).

Features: ARF design; comes with 4-stroke O.S. .52 Surpass engine; composite construction; independently damped head. It has an easy starting, forward-canted engine position with an aft-mounted, highly visible fuel-tank location and is accompanied by a superb assembly manual that features detailed isometric views so you can easily understand the mechanical assemblies.

Comments: my Legato was ready to fly after a few hours of assembly. I've never had more people crowd around to see a helicopter; they came from other clubs to see this one.

Hits

- Quiet, economical 4-stroke operation.
- Fantastic price!
- Practically all the assembly was done.
- It's tough.

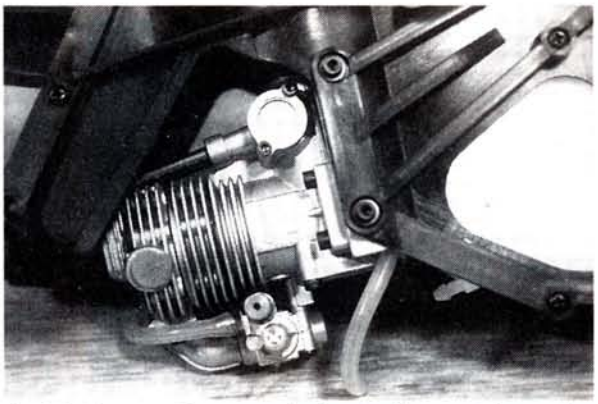
Misses

- Prop drive washer for the engine was not included (engine couldn't be broken in separately).

• **Canopy.** The canopy is held on with neat spring-loaded posts that you have to assemble and install on the main frame. Next, I trimmed the windshield, which is held to the canopy with tiny Phillips screws. The decals are next, and I spent over an hour cutting them out and placing them on the canopy. Elapsed time: 4 hours, 10 minutes.

ENGINE AND FUEL SYSTEM

All helicopters are susceptible to ingesting dust and dirt because they spend so much time hovering near the ground. On most models, this is a fact of life you can't do anything about because the air intake is enclosed in the cooling duct, but the .52 Surpass carburetor is exposed on the Legato. I took the precautionary step of installing a Bru-Line* no. 104 coarse air filter with a nylon tie to secure it. Additionally, I installed a Kalt* fuel-line clamp on the fuel-supply line to prevent the fuel tank from siphoning itself dry. Also, Kyosho have supplied a spectacular, polished exhaust for the Legato. It's installed with a special flexible, stainless-steel header that's threaded at both ends. One end goes to the head of the engine and the other to the muffler body itself. I used a couple of wraps of Teflon tape to ensure a leak-free seal. The hardest part was bending the supplied support strap around the body of the muffler. I used my hands for the major bend and pliers for the ends—easy enough. Elapsed time—4 hours, 30 minutes.



An O.S. Surpass .52 powers the Legato. The canted mounting angle makes it easier to get to the starting cone.

IN THE AIR

Although I'd rather not fuss with a new model *and* a new engine simultaneously, the Surpass is of such high quality that break-in time is minimal. Before starting, I sprayed my driveway with water to minimize dust and grit. Next, I opened the main needle $2\frac{1}{2}$ turns and fueled up with Morgan* 30-percent Special Heli fuel. I connected the glow battery and started it up. The engine settled into a high idle, but because the Legato's clutch engages at a slightly higher rpm than most models', that worked out perfectly. I released the head and stepped back while applying T/C (throttle/collective). The main rotor spun up, but the mix was too rich to lift off at mid-stick. I kept opening T/C, and at about $\frac{3}{4}$ stick, it broke ground. Naturally, the T/R mix was off a bit but still easily controllable. I raised the model to an eye-level hover to check the tracking. Then I let it settle to the ground and shut the engine off to let it cool. I adjusted the tracking one full turn and tried it again. While the tracking was still a bit out, I lifted the model into a brief hover and settled it back to the ground. I repeated this about eight or 10 times, then shut the engine down and let it cool until I could comfortably grasp the head. I readjusted the tracking and leaned the needle a bit; after a couple of tanks of this (remember to wet the driveway as it dries), I felt the model was ready for forward flight trials. It was time to go to the field.

FLIGHT PERFORMANCE

During church Sunday morning, it was all I could do to keep my mind where it belonged. Soon enough, I got to the field, and all my friends crowded around to see the Legato. There was eager anticipation on the part of all to see a 4-stroke helicopter fly. Remember, until the Legato arrived on the scene, 4-stroke helicopters cost nearly three times more! All flying came to a halt as I prepared the model for flight. I started the Surpass engine and carried the model out to the flight line. There was a slight breeze from my right. I lifted the model into a brief hover and then performed a pirouette to the right. I followed that with one to the left (a slight bobble, but that's my thumbs). Next, I tried a nose-in hover, and all was well. (The sound of the helicopter is awesome, as the blade and gear noise can be clearly heard; the model sounds like the real thing.) I advanced the T/C and entered forward flight. The T/R mix is off, but that will be easily handled by the Futaba 6XH REVO mix later. For now, I won't worry about it; I'll simply adjust the flight path with my thumb. It's far too early to worry about mixes, as they won't stay the same until the engine has been completely broken in. I flew the model around the field and then set up an autorotation landing approach. Not to worry: I had no intention of performing an autorotation at this early stage; it's just that with a new engine, I'd rather have the flight profile planned for a flame-out than be surprised. The Surpass settled into a nice idle, and the model made a great simulated autorotation approach. There's not much tendency to sit back on its haunches as many models do. About 15 feet off the deck, I added T/C and the model settled into a nice hover, with yells of "All right!" and "Beautiful!" from my buddies.

CONCLUSION

I'm glad I bought a Legato. There aren't any quirks in its flying characteristics, and the sound alone makes the purchase worthwhile. I've found the Legato to be low maintenance, and the O.S. Max .52 Surpass exceeded my expectations and hasn't "hiccuped" once. To date, this machine has started easily and run reliably, and it seems to get better over time. Its power is hard to describe, and its lower toned exhaust note is deceptive, as the performance is everything you could hope for. The Kyosho Legato is highly recommended—enough said!

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.* ✦

About the Author

An experienced modeler and R/C helicopter aficionado, John Beech is the owner/producer of Panache Video Productions®, a company that produces videos on how to set up, fly and do stunts with helicopters.

AT THE 1996 Mid-America Electric Fun Fly, I observed several Graupner Speed 400-powered pylon racers tearing up the sky. These pocket-size planes had good performance and some definite advantages over larger electric planes. The MicroSport was designed to capture some of these advantages in a fully aerobatic sport plane. It features full 4-channel control, including a tiny electronic speed control. After a few conversations with Keith Shaw—and some rough calculations—I began the construction of the MicroSport. The result is an electric sport airplane that is easy to transport, easy to fly and fully aerobatic.

MICROSPORT

by JIM YOUNG

A pocket-size, sport/pattern electric

BILL OF MATERIALS

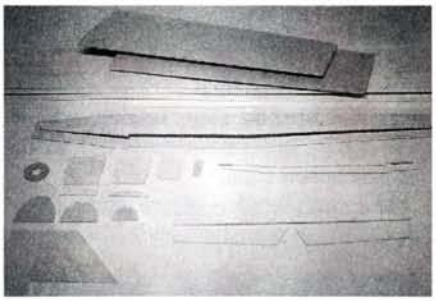
- 3 sheets 1/32x3x36-inch balsa (wing skins and turtle-deck sheeting)
- 2 sheets 1/32x4x36-inch balsa (wing skins)
- 1 sheet 1/16x4x36-inch balsa (fuselage sides and formers)
- 1 sheet 3/32x4x36-inch balsa (tail surfaces, fuse doublers, fuse stringers and wingtips)
- Scrap 1/16-inch plywood (fuse formers)
- Scrap 1/64-inch plywood (wing hold-down plate)
- Scrap 3/32-inch-square spruce (elevator joiner)
- Foam wing-cores

CONSTRUCTION

Weight is a major consideration with any electric-powered plane. It will help to have a postage scale available. Select the wood for this project carefully and take it easy on the glue. Take time to make joints tight before you apply the glue. If you need to spray kicker on CA, you're using too much! There isn't much to this little plane, so before you buy wood, check your scrap bin.

It will greatly speed construction if you "kit" the model first, before you start the assembly. I used the pinprick method to transfer the plans to the wood before I cut out the parts. Just prick a hole through the plans directly into the wood at each corner or at several locations along a curve, and connect the dots. This saves you the trouble of copying, tracing, or cutting up the plans.

• **Tail feathers.** It doesn't get much easier than this. Use 3/32-inch, C-grain balsa for all tail surfaces. Glue the tips onto the stab, fin, elevators and rudder, and join the elevator halves with 3/32-inch-square spruce. Sand the leading edge (LE) of the elevator and rudder to an angle, as shown on the plans. You can cut lightening holes if you want to take the time, but the weight savings are insignificant, and they will weaken the structure. Sand all surfaces smooth, and round the leading and trailing edges.



It greatly speeds construction if you "kit" the model first. This won't take long due to the low parts count.

• **Fuselage.** Mark the location of all the formers (including TD2) on the two 1/16-inch balsa sides. Make sure that the nose is square to the top of each side. The lightening holes in the rear half of the fuselage side are more for servo access and hookup than for weight savings. Add 3/32-inch-square balsa stringers to the sides along the top and bottom. The stringers stop 1/16 inch from the front of the fuselage sides to allow for F1. Be sure to make a left and right side. Glue the 3/32-inch balsa wing saddles to the two sides. Sand the stringers at the tail to a taper according to the plans.

The fuselage is assembled upside-down over the plans. Glue F2A to F2. Glue the F2 assembly and F3 to one fuse side. Glue the two sides together at F2 and F3. Pin the assembly over the plans and bring the two sides together at the tail and glue them. Make sure that the joint is centered over the plans and is square to the building board. Next, add F4, F5 and the 1/16-inch ply wing hold-down plate. Last, glue F1 to the front of the fuselage. Make sure it is centered on the plans and is square to the building board. You may need to wet the fuse sides to help them conform to F1. Keeping F1 centered on the plans, glue the three 3/32-inch stringers to the front of the fuselage between F1 and F2 and finish with the 1/32-inch balsa front bottom sheeting.

Remove the fuselage assembly from the board. Cut and install the elevator and rudder pushrods. Install and hook up the elevator and rudder servos before you glue the 1/32-inch balsa cross-grain sheeting aft of the wing trailing edge (TE). Cut a small cooling vent just aft of the wing TE. This hole also provides limited access to the servos. The servos used are the tiny micro variety that weigh about 1/2 ounce each.

Trial-fit the motor now. You may need to trim the stringers somewhat for it to fit properly. Glue D1 in position and cut and glue the three 3/32-inch stringers between F1 and D1. These stringers are spaced evenly across the top of F1. Take time to sand the correct angle on the stringers for a tight fit. Finish the front top of the fuselage by gluing on 1/32-inch balsa sheeting. Cut holes in F2 and F3 to allow access to the motor and servos.

The motor installation is tight, but it fits. Plenty of room for a small speed control.

SPECIFICATIONS

Model: MicroSport

Type: sport/pattern electric

Wingspan: 29 in.

Wing area: 150 sq. in.

Weight: 16 oz.

Wing loading: 15.4 oz./sq. ft.

Airfoil type: semisymmetrical (NACA 1412)

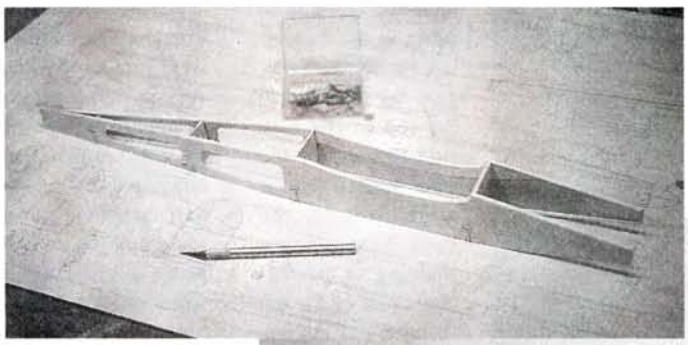
Length: 25 in.

Motor req'd: Speed 400 7.2V

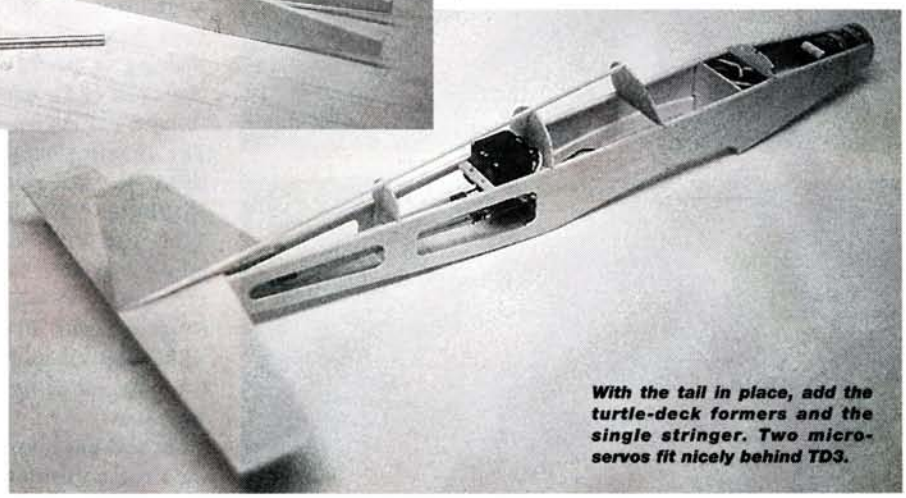
Radio req'd: 4-channel

Batteries req'd: 7-600mAh

Features: the MicroSport is balsa, plywood and foam construction. An inexpensive Graupner motor is used for power. Full 4-channel control allows total aerobatic freedom.



Fuse assembly is typical—upside-down over the plans. Make sure to keep the tail square to the board when gluing it together.



With the tail in place, add the turtle-deck formers and the single stringer. Two micro-servos fit nicely behind TD3.

PHOTOS BY JIM YOUNG & CHRIS SORGATZ

FLIGHT PERFORMANCE

• Launching and landing

A good, level toss into the wind is needed to launch the MicroSport. Keep the plane level and allow it to build up some speed before climbing out. By the time it reached the end of our field, a healthy climb rate was possible. Landing approaches can be quite short. The model glides well and can really be slowed down for gentle belly landings. The stall speed of this model is around 15mph, which is probably much slower than your typical sport plane. The shape of the tail keeps the rear control surfaces well out of the grass on landings.

• Low-speed performance

The first prototype had a bad tip-stall tendency due to a thin airfoil. The second prototype uses a 12-percent airfoil with some washout; this has corrected the problem. The stall is gentle; it just mushes forward until you drop the nose and pick up some speed.

• High-speed performance

The plane is not as fast as my other sport planes, but it grooves well. Since it is not too fast, it is not squirrelly or hard to handle at high speed. It goes where you point it, and you can keep it in quite close, which helps with a plane this size. A local schoolyard would be a good place for this plane, and you don't have to worry about any noise problems.

• Aerobatics

This is what I designed this plane for. With full 4-channel control, anything in the book is possible. Rolls, loops, stall turns, even knife-edge are all within the capabilities of this aircraft. Rolls are very axial and require minimal elevator input when inverted. Loops from level flight are round and large for a plane this size.

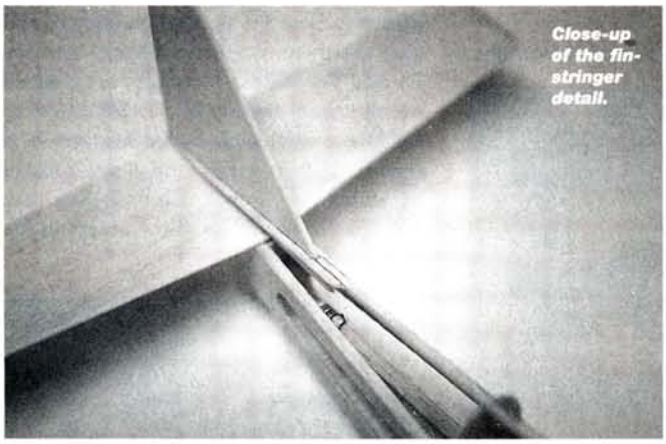
With the fuselage assembly upright and level on the building board, trial-fit the stabilizer. Sand the rear top of the fuselage side until the stab is level to the building board. Measure from the front of the fuselage to each stab tip to make sure it is square to the fuselage before you glue it in place. Glue the fin assembly to the stab, making sure that it is square to the stab and in line with the fuse centerline.

Make a template from the plans to set the angle on TD2. Glue TD2, TD3 and TD4 in place. A single 3/32-inch-square balsa stringer runs from TD2 to the LE of the fin. Use a straightedge to make sure the top of the turtle deck will be straight. Adjust TD2, TD3 and TD4 accordingly before gluing the stringer in place. Two additional 3/32-inch-square balsa stringers are added to each side of the fin. These stringers extend 1/2 inch in front of the fin LE and are glued to each side of the fin and the stringer. Sand these stringers to follow the curve of the turtle deck and the taper of the fuselage.

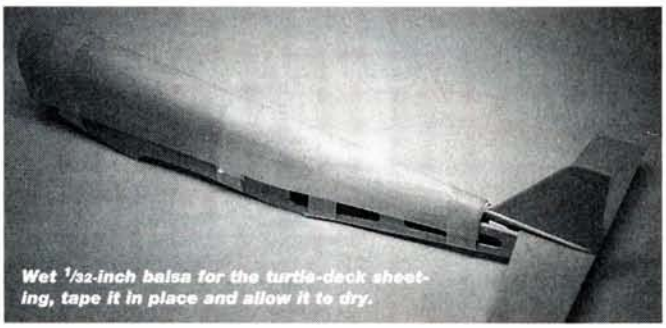
Cut two pieces of 1/32-inch balsa for turtle-deck sheeting. Soak them in a solution of ammonia and water and tape them to the rear portion of the fuselage, forming them to the turtle-deck shape. Allow the sheeting to dry before proceeding. Cut the dry, curved pieces of balsa sheeting to fit the rear turtle deck. Work slowly to ensure a good fit. Glue the sheeting in place in the following sequence. First, glue the sheeting to the top of the fuse side and top of the stab, making sure it is flush with the sides. Next, glue the sheeting to the formers, half of the top stringer and the fin. The sheeting may need to be slit lengthwise between TD2 and TD3 to allow it to form to the fuse shape. Reinforce the slit with scrap 1/32-inch balsa. Repeat on the other side.

Cut and glue 1/16-inch balsa cockpit sides between D1 and TD2 as shown on the plans. Sand the entire fuselage smooth. The canopy is cut down from a stock Sig 12-inch bubble canopy.

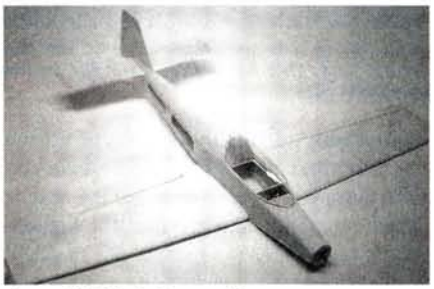
The completed fuselage and canopy should weigh approximately 2 ounces.



Close-up of the fin-stringer detail.



Wet 1/32-inch balsa for the turtle-deck sheeting, tape it in place and allow it to dry.

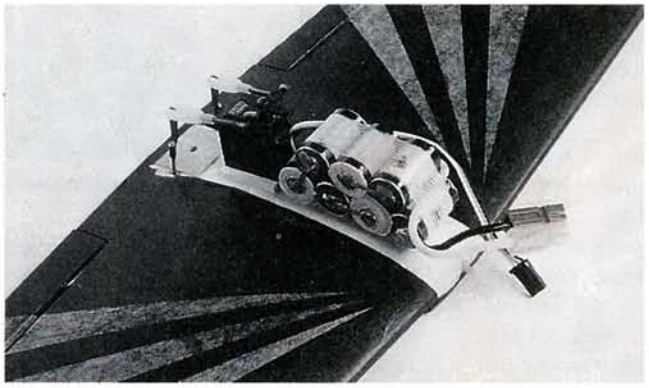


A very light but strong airframe.

• **Wing.** The wing is typical foam and balsa sheeting construction, with a few twists. The template outlines included on the plan were generated with CompuFoil*. This is a very powerful program, and it allowed me to import the wing templates directly into the CAD-drawn plans. Please note that the templates are set up for a 0.03-inch wire kerf, and that you should cut the bottom surface of the wing first. Prepare your templates and cut cores from 1 1/2-pound-density white or blue foam. Be sure to include the 3/32-inch washout. While Compufoil can automatically put in any degree of washout, I prefer to use the shank of a drill bit under the TE of the tip template to set the washout. This is more versatile than making different templates for different washout angles. A set of cores is available from me for $18: Jim Young, 7563 Wellington, Brighton, MI; (248) 437-8341.

Prepare four sets of wing skins from 1/32-inch light balsa. I used 3M 77 spray adhesive to attach the wing skins, but you can use your own preferred method. Keep in

mind that weight is crucial. Attach the bottom skin first. Lightly mist the wing skin and the bottom of the core with 3M 77 and let them dry for a few minutes. Lay the wing skin in the bottom bed and line up the core before you press it onto the skin. Apply even pressure to the core and make sure it is lined up with the bed to avoid warping the wing.



Use double-sided tape to mount the aileron servo. Some scrap balsa helps keep it from twisting under flight loads. Velcro®-brand fasteners make the battery removable for charging.

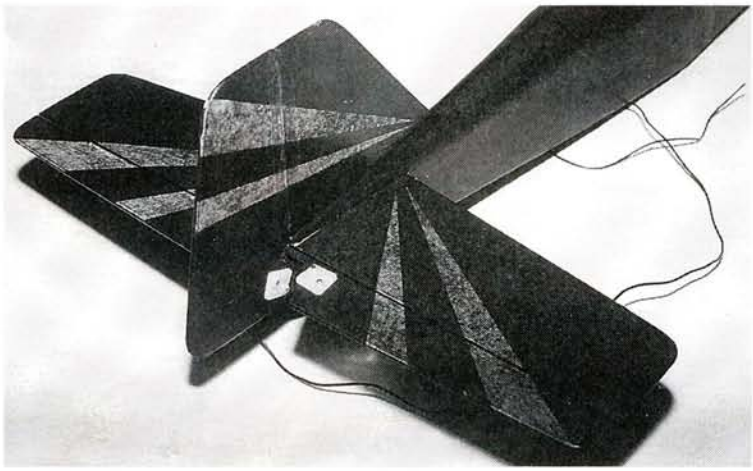
You only get one shot at this. Trim the wing skin to size. Measure and mark the location of the ailerons and torque rods. Sand the sheeting to a taper at the trailing edge. Remove the foam from where the torque rods will go. I made the torque rods from music wire and scrap Nyrod. Use a small amount of epoxy to install the torque rods. Do *not* glue the torque rods to the ailerons yet. Mask off the torque rod before you apply the spray adhesive for the top wing skin. Apply the top wing skin, allowing for the torque rod exits. Put the sheeted wings back in their beds and press them overnight to ensure strong, straight wings.

Trim the top sheeting to size and glue on the 1/8-inch balsa LE. Mark the location of the ailerons and cut them free. Sand the TE of the wing flat and apply 1/32-inch balsa facing and the 1/16-inch balsa cap. Sand the LE of the aileron to the angle shown on the plans and add 1/32-inch balsa facing. Trim the ailerons to length minus 1/8 inch and add 1/16-inch balsa endcaps. Trim the aileron LE facing for the torque rods and trial-fit the ailerons. The ailerons are hinged by tape along the bottom surface after covering.

With the wing halves upside-down, sand the center square to the building board to establish the dihedral. The top of the wing should be flat from tip to tip. Glue the wing halves together with white glue or a thin layer of epoxy. Once the center glue joint is set, apply a 2-inch-wide strip of 3/4-ounce fiberglass cloth around the joint.

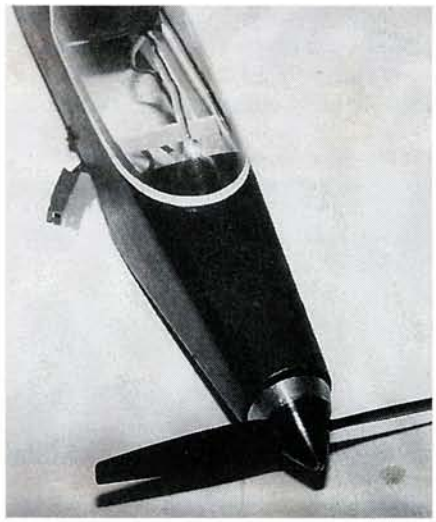
Add the 3/32-inch balsa wingtip pieces and tip blocks and sand to shape. Next, drill an 1/8-inch hole in the center of the LE and glue in the 1/8-inch wing-mounting dowel. Finally, add the 1/64-inch ply wing-mounting plate to the bottom to complete the wing. The completed wing should weigh approximately 2 ounces.

• **Fuselage and wing assembly.** Mark the centerline of F2. Use the wing to establish the height of the hole in F2 for the wing-mounting dowel. Drill an 1/8-inch hole in F2 for the dowel. Install the wing on the fuse and check alignment with the stab. If necessary, sand the wing-saddle area until the wing is level with the stab. Measure from the tail to each wingtip and adjust the wing until the two measurements are equal. Tape the wing in place and drill a hole through the 1/64-inch wing-bolt plate, the wing and into the wing hold-down plate in the fuselage. Remove the wing and enlarge the hole in the wing to clear a 6-32 bolt. Tap the hole in the wing hold-down plate for a 6-32 thread. Reinforce the threads with thin CA and re-tap after it cures.



The rudder is hinged with book-binding tape on the right side only.

• **Covering.** Resist the urge to use your normal iron-on covering. It will add significant weight that this plane does not need. Consider tissue and dope or Micafilm. I used a lightweight, colored tissue and clear dope. Paint the entire model with two coats of clear butyrate dope and sand lightly between coats. Cut tissue to size as you would for iron-on coverings. Working in a well-ventilated place, lay the tissue in place and brush on straight dope thinner over the tissue. Work on a small area at a time and rub the tissue down to the surface. The thinner will soften the dope, and the tissue will bond to it. Pull the excess tissue around edges and tape in place until the thinner dries. Around edges and corners, score the tissue and hold it down until the dope sets up. Trim the excess and paint the edges of the tissue with more dope before you overlap the next piece of tissue. This gives the next piece something to adhere to. Try to overlap pieces on flat surfaces. Otherwise, you will have problems keeping the edge of the tissue down around a corner. Wet the tissue at the wingtips and at the open structure on the rear of the fuse to shrink it tight. Paint on a coat of dope and add any trim colors with the same technique. One more coat of dope and you're done. Be careful when working near the wingtips; the dope and thinner will attack the foam. This finishing method is very durable and adds very little weight (iron-on covering can add several ounces).



I used RC 56 to attach the modified Sig Canopy.

• **Motor hook-up and final assembly.** Use a speed control with a battery eliminator

circuit (BEC) such as the one by Lofty Pursuits (available from New Creations R/C*). You can't afford the weight penalty of a separate receiver battery. Solder the speed control directly to the motor, and add a connector and an arming switch to the battery side of the speed control. This will allow you to use one switch to arm the motor and turn on the receiver (every little bit helps). Assemble a battery pack (see article by Keith Shaw in *Model Airplane News,* August, 1993). I used seven Sanyo KR600AE cells. Use Velcro®-brand fasteners to mount the battery pack to the top of the wing. If you start experimenting with propeller and battery combinations, keep in mind that a Speed 400 can only handle about 10 amps. A Master Airscrew 5.5x4.5 propeller seems to be a good choice for this motor/battery combination.

Hinge the control surfaces with book-binding tape (available at office-supply stores). Hook up the control rods to the tail surfaces. Install the aileron servo on top of the wing with two-sided tape and some scrap balsa guides. The receiver sits behind the canopy and is held in place with some foam and a few scraps of balsa. If you really want to save weight (and void your receiver warranty), remove the case first. Be sure to fasten the antenna wire to the tail. You don't want to do a stall turn and have the antenna fall forward and wrap around the prop! Set the control throws according to the plans. Pay particular attention to the elevator throw; I had too much on the maiden flight, which made it quite interesting.

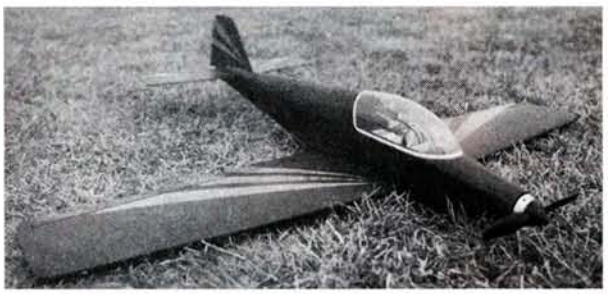
Glue the canopy into place and balance the model as shown on the plans. Do not add any additional weight to the model. Move the battery pack and receiver around to balance the model. The total flying weight should be 16 to 17 ounces. If you come in an ounce or two over this, consider removing the rudder servo.

All that's left to do is charge the batteries, throw it in the front seat of your car and head for the field!

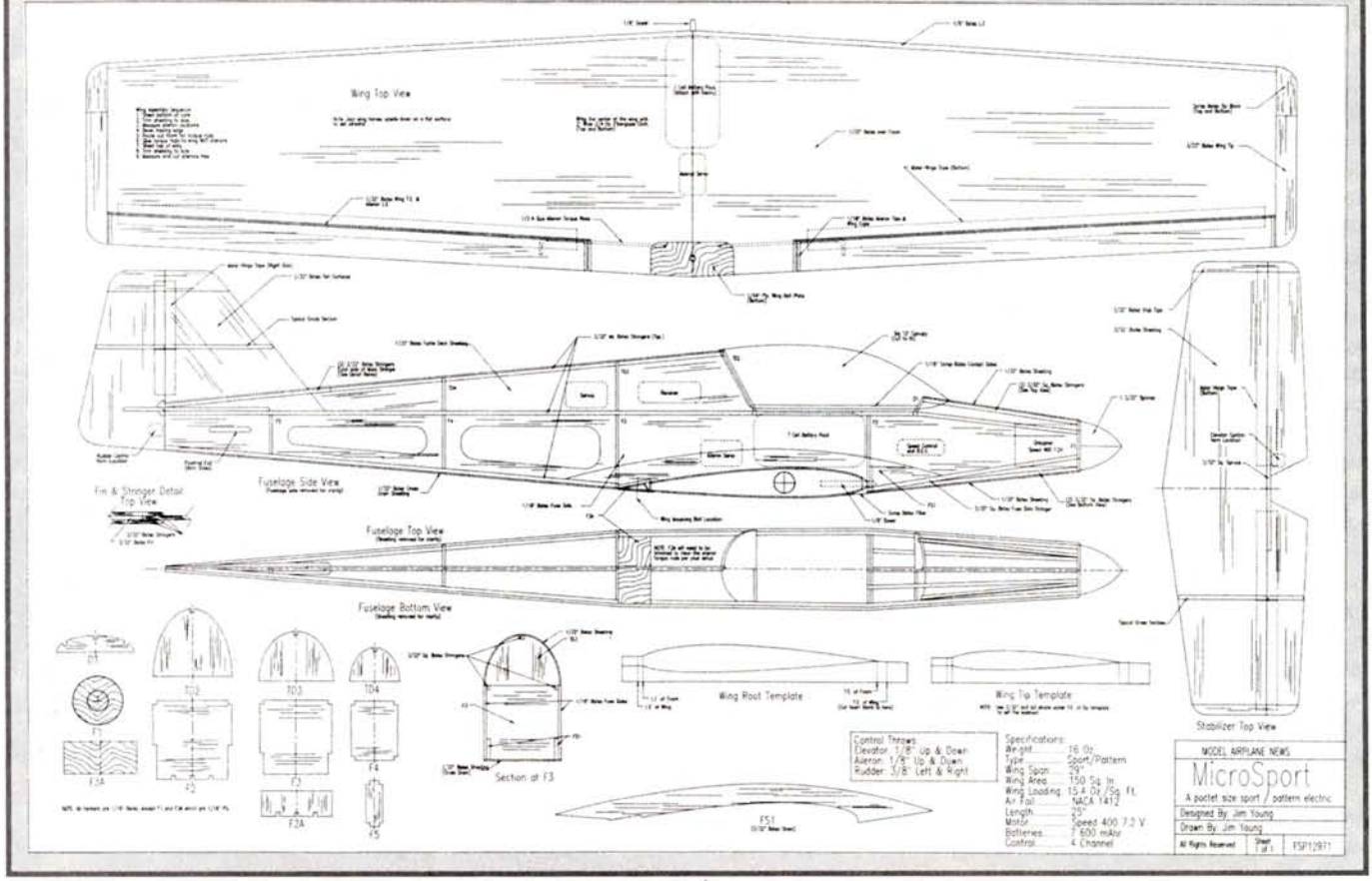
**Addresses are listed alphabetically in the Index of Manufacturers on page142.*

Tom Brindley prepares to launch the MicroSport on its maiden flight. I'm at the controls.

The MicroSport is a great small-field flier.



To order the full-size plans (FSP12971), see Pilots' Mart, page 127.

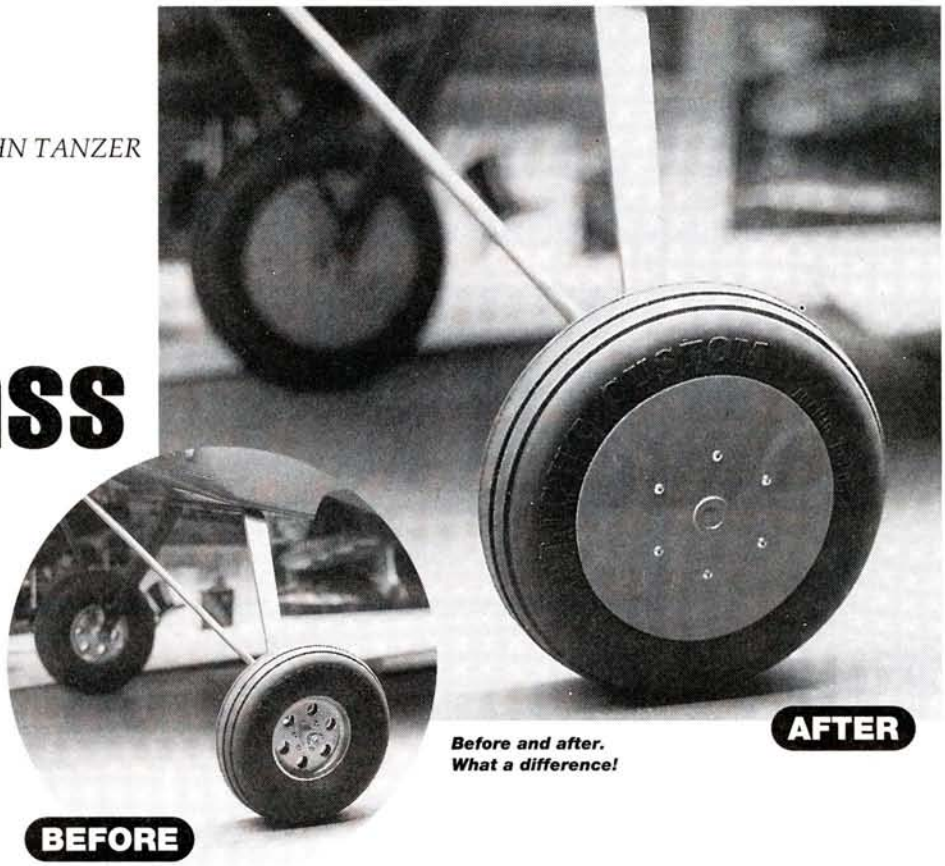


MODEL AIRPLANE NEWS
HOW TO

by JOHN TANZER

Make Fiberglass Wheel Covers

Standard wheels become scale

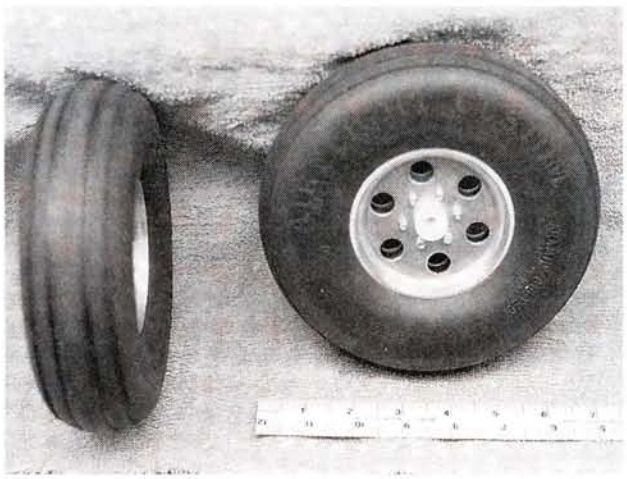


Before and after. What a difference!

I NEEDED 7-inch, disk-type wheels for a giant-scale biplane I'm building, and I decided that the easiest solution would be to add fiberglass disk wheel covers to some commercially available wheels. I ordered a set of Sullivan Products* 7-inch wheels. These well-made, good-looking wheels have firm rubber tires with the words "AIRFLIGHT CUSTOM, ARAMID BELTED, INFLATE TO 30PSI MAX" in raised letters on the sidewalls. The two-piece aluminum hub is held together with six socket-head screws and locknuts, and the center bushing is nylon and is bored out for a ¼-inch axle. The wheels weigh 15 ounces each.

For the fiberglass mold, use an aluminum pot lid with the proper curve and with its center knob removed. Cover it with clear heat-shrink plastic pulled tight and taped to the back, then heat-shrink the front. Cut three disks out of 6-ounce fiberglass cloth. Lay these on the plastic, alternating the weave direction so the part will be stiff. Mix up some Z-Poxy* finishing resin, which wets out the cloth well and makes a rigid but flexible part. When mixing resin, always measure an exact 50:50 mix. When it has been thoroughly mixed, pour resin onto the cloth and spread it with a brush. After the cloth has been completely wetted, cover it with another piece of heat-shrink plastic. Pull it tight and tape it at the back, then shrink it with the heat gun. (If you don't use enough resin and pinholes develop later, you can fill them with spackle.) Let the resin cure overnight, then remove the top layer of plastic. Using a compass

The materials needed to make a disk-type wheel: a commercially available wheel, 6-ounce fiberglass, Z-Poxy, clear heat-shrink plastic and an aluminum pot lid with its center knob removed.

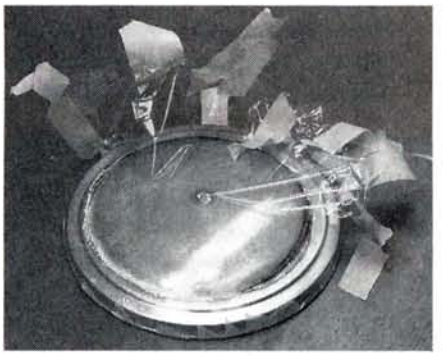


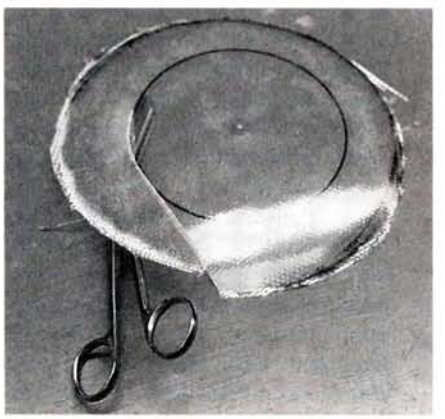
Sullivan Products 7-inch AirFlight wheels. These well-made, good-looking wheels weigh 15 ounces each.

The clear heat-shrink plastic has been shrunk tight. We're ready for glass cloth.

Z-Poxy resin is applied to the glass cloth.

Top piece of clear heat-shrink plastic taped and shrunk over the wet glass cloth.





Above: after the resin has cured, remove the top plastic. Below top: draw a circle on the fiberglass using a Magic Marker taped to a compass. Below bottom: the fiberglass disk is cut to shape with sharp scissors.

PHOTOS BY JOHN TANZER

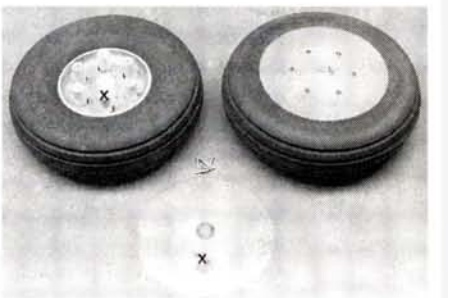
with a Magic Marker taped to it, mark a 4¼-inch circle, remove the part from the mold and cut the disk out with sharp scissors. Leave the plastic on the mold to make the second disk.

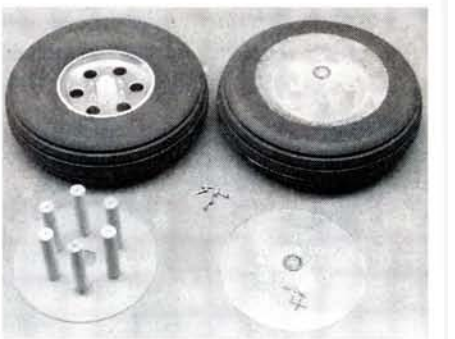
The inner wheel disk is flat and made of fiberglass flat stock, phenolic sheet, aluminum or 1/32-inch plywood. Fiberglass flat stock can be made by sandwiching three pieces of 6-ounce cloth between two pieces of ½-inch plywood covered with heat-shrink plastic. To mark the inner flat disk for ⅜-inch dowels, hold the disk against the back of the wheel and use a pencil to mark dowel locations through the holes in the wheel hub. Cut six 3/8-inch dowels for each wheel, and screw them into the inner disk. Use Zap* CA to glue the dowels to prevent them from turning. To install the front disk, push the inner disk with dowels through the wheel, then lay the outer disk on the dowels. The disk is transparent and is easily drilled for no. 2 button heat screws. Mark one dowel and screw hole on the inside of the disk with an "X." This will aid in assembly later.

Glue a ring washer to the center of the outer disk for a scale look, then prime and paint the disks. To mount a wheel on an axle, install an inner ¼-inch wheel collar, then put the inner disk with dowels through holes in the wheel hub, and slide the wheel on with an outer ¼-inch wheel collar to retain it. Now you can mount the outer wheel cover using the "X" to position the screw holes in the dowels. I've added fiberglass disks to C.B. Tatone* wheels as well. I glued plywood rings to the inner and outer wheel rims so that I would have something to attach the disks to.

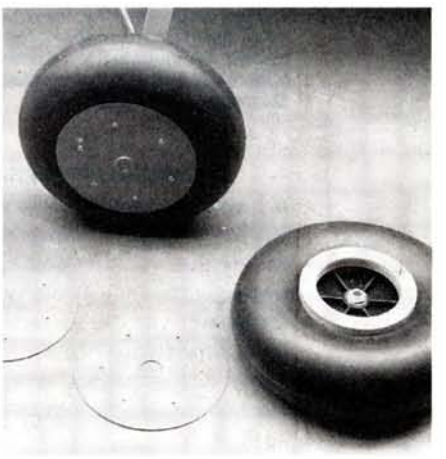
Try this method. It works well for me.

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*





Above top: "X" marks the spot where the disk screw hole lines up with the dowel.
Above bottom: the finished wheel cover parts and wheel with parts installed.
Below: same treatment using C.B. Tatone wheels. Note the plywood ring used as the cover mount.



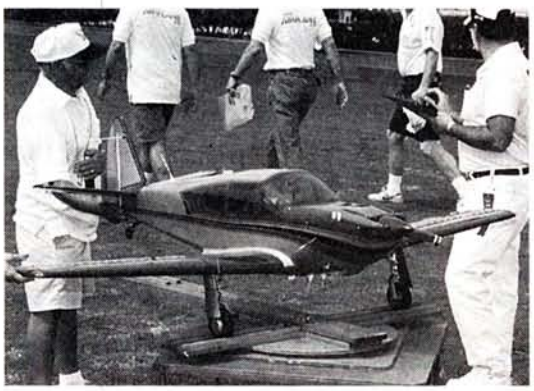
Scale TECHNIQUES

by GEORGE LEU

CIVILIAN AIRCRAFT AND RIB STITCHING MADE EASY

Top Flite's Cessna 182 is an IMAA-legal alternative to heavy metal warbird scale subjects. Documentation is as easy as it gets with the Skylane; just check your local airport.

SCALE COLUMNISTS tend to gravitate toward military/warbird types of models when selecting subjects for their columns. I know I am guilty of this. WW II warbirds interest me as both flying designs and historical subjects. They are not, however, very easy to build, fly, or document. Often, documentation is restricted to photos and drawings, and many just can not easily be seen up close and personal; many do not even exist anymore. Are WW II aircraft the only good subjects for beginner (or even intermediate) scale modelers to start with? Certainly not.



Corvin Miller has been campaigning his civilian Globe Swift for many years. With good flight performance, retracts and proper documentation, Corvin's model has competed very successfully against Mustangs and Phantom Jets.

CIVILIAN AVIATION

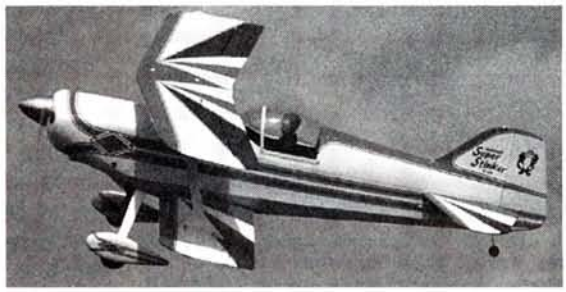
If I were to suggest the best scale subject for someone to start with, it would be one that's comfortable to fly and easy to document. Civilian aircraft are the answer and can be seen at every small airport across the country. Small details such as hatches, latches, lights, antenna, etc., are there to be seen right up close.

You can easily document civilian aircraft color and markings with your own camera. If you are persistent, you can probably develop a relationship with the owner of the subject aircraft and possibly obtain factory 3-views and even FS paint numbers. (Keep in mind that photos can be used in place of 3-view drawings.)

About 10 years ago, I heard it said that civilian aircraft don't score well in static competition because there aren't enough rivets and panel lines to satisfy the judges. (This is obviously a spin on why warbirds do score so well in competition.) Well, I don't buy into that kind of thinking any longer. Today, our judges are much more sophisticated and do a very good job interpreting scale documentation. If you do a good job matching your model to your documentation, you'll get a high score. Take scale competitors Corvin Miller (Globe Swift), Charles Nelson (WACO cabin biplane) and Graeme Mears (Tiger Moth), for example. Each has competed against ducted fans and warbirds at many contests, including the Scale Masters and Top Gun, and they all have been winners.

I might also add, full-scale civilian aircraft do indeed have panel lines, rivets and screws. If you look closely, you may even see signs of weathering at some panel joints. Go out to the local airport and walk around; I'll bet you'll find a Cessna or Bonanza that strikes your fancy.

The flying characteristics and wing loadings of civilian aircraft fall in favor of the newcomer's flying skills. The confidence you'll have when flying these types of models should translate into high flight scores. If you feel the need to add a mechanical option to enhance your flight score, retractable landing gear and flaps are common features. Add to these navigational and exterior lighting systems, highly visible cabin interior detailing and well-documented, colorful paint schemes, and you have a really good scale entry.

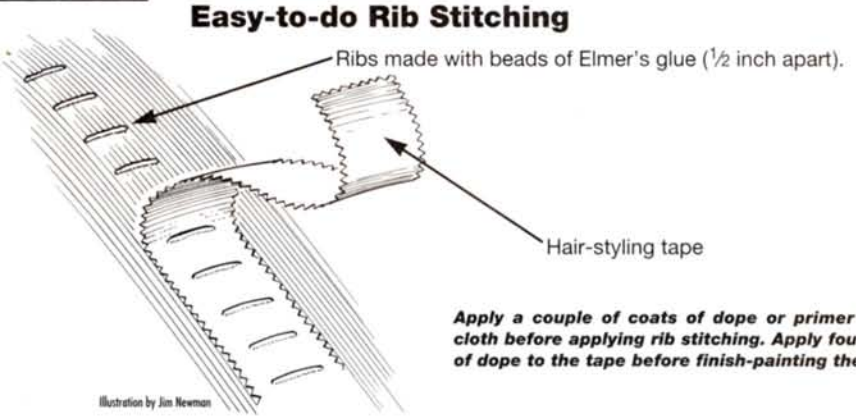


Midwest's Super Stinker Pitts is another choice for a civilian subject. The newest aerobatic biplane in the Pitts Special lineup, the Super Stinker can be seen at many full-size airshows.

Top Flite* has two really good kits that fit the bill, the Cessna 182 Skylane and their new Beechcraft Bonanza. These kits offer the modeler well-designed, good flying models that are very easy to find documentation for. There are, of course, many other companies producing civilian model kits. Midwest* offers a great selection of sport aerobatic aircraft commonly seen at full-size airshows. If you have the required piloting skills, then their Pitts Super Stinker biplane, Cap 231 and the ever popular Extra 300 would make excellent scale subjects. Well-known manufacturers such as Byron Originals*, Balsa USA*, Sig*, Pica*, Bob Holman Plans Service* and Jim

Cliff Tacie has a weakness for civilian aircraft and always does well at Top Gun with his Modified Fly Baby. The open-cockpit, cloth-covered, scale homebuilt is full of scale detail. Rib stitching and surface tapes, screw heads, panel lines and scale rigging wires all add up to an impressive model of a simple design. The Fly Baby is an excellent flyer.

Easy-to-do Rib Stitching



Apply a couple of coats of dope or primer to the cloth before applying rib stitching. Apply four coats of dope to the tape before finish-painting the wing.

Pepino's Scale Plans and Photo Service*, to name just a few, also fill the sky with civilian, general aviation wings. So it's not like it's very hard to find things to build. As the "Scale Techniques" column continues to evolve, I promise to devote more time to discussing interesting civilian subjects.

SIMPLE RIB STITCHING

Talking about civilian aircraft, here's a technique that can be used on ¼-scale and larger-size models—scale rib stitching. The main ingredients for this technique are found at the local supermarket: Elmer's glue and hair-styling tape. The ½-inch-wide tape comes on a tape dispenser and has nearly ¼-scale serrated edges. First, cover the wing, then apply a coat or two of dope or filler to seal the cloth. Let it dry, and then we're ready to go.

I start by applying ¼- to ⅜-inch-long beads of glue (applied directly from the bottle) every ½ inch along the rib top. When the glue dries, it will shrink in height and may seem hardly noticeable. Apply the hair-styling tape over the

"stitches," making sure it is centered over the rib, and burnish it down with your fingers. When all the ribs have been covered, apply at least four coats of dope to the tapes to seal them to the wing covering. You can now proceed with the rest of your finishing process, and the results will satisfy the most demanding critic. On the tail surfaces, I recommend the use of the tape but without the glue "stitches." This is a personal choice, but since the tail stitching is so small on the full-size aircraft, the detail is hardly noticeable. Some areas of a model need a subtle touch of scale detailing, while others, like the big cloth-covered wing, need a treatment that literally reaches out and grabs you.

However you apply your rib stitching, it is important to keep the stitches as neat and in line with each other as possible. Measure off and mark a piece of paper, and use it as a spacing guide. A neat appearance is very important to any scale modeler.

Want to have great-looking scale pilot figures in your cockpit? Then get this tape.

PAINTING PILOTS

Scale pilot figures add much to the finished look of our models. But a badly painted one just isn't worth gluing into place. A new video produced by Robin's View Productions* entitled "How To Paint Pilot Figures" should help you greatly improve your skills. This 2-hour video features Don Typond as narrator and teacher, and goes through the techniques of using a paintbrush to bring your little plastic cockpit buddy to life. Throughout the tape, Don discusses paints and brushes, and details how to make hair, skin tones and clothing look scale. He also highlights how to position pilot figures in the cockpit, paint WW II pilots and many other topics. This video is a good investment for any scale modeler and is ideal for R/C clubs looking to expand their video library. Give this video a try; you'll love the results.

SOUTHERN SCALE WARBIRDS ASSOCIATION

Not to ignore warbirds completely this month, I'd like to mention a relatively new warbird organization. The Southern Scale Warbirds Association (SSWA) is headed by Chris Joiner and is dedicated to promoting WW II giant-scale R/C warbirds. Chris publishes an excellent quarterly newsletter that covers topics such as WW II aviation history, scale competition, giant-scale rallies, kit reviews, building techniques, etc. The organization promotes the important things such as friendship and camaraderie, and I highly recommend that you consider joining me as a member. Dues are $20 a year. Contact Chris c/o Southern Scale Warbirds, P.O. Box 4469, Columbus, GA 31904-0469. Tell 'em George sent ya.

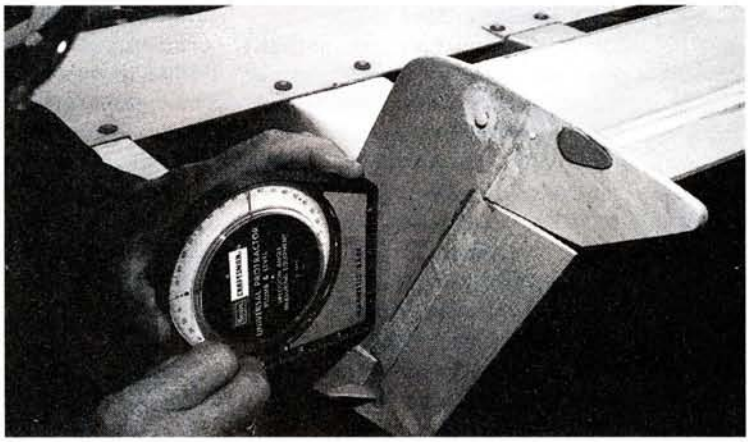
**Addresses are listed alphabetically in the Index of Manufacturers on page 142.* ✦

Scratch-Builders' CORNER

by GEORGE WILSON JR.

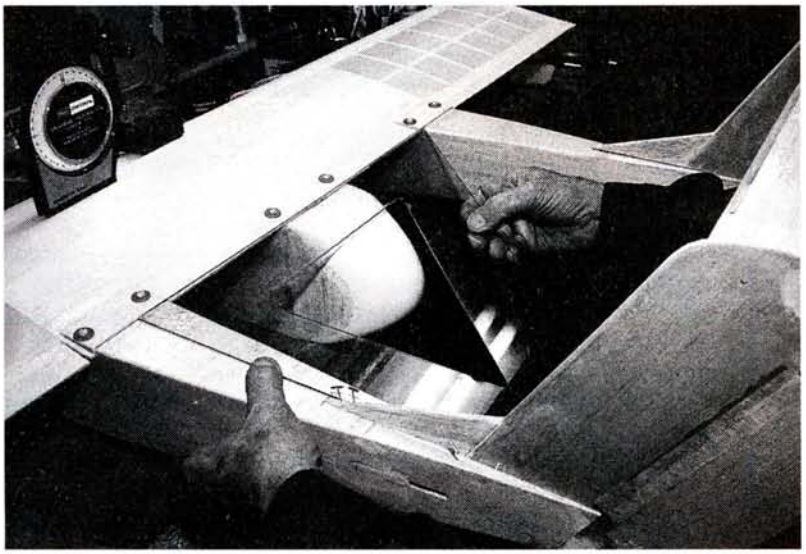
JIGS AND TEMPLATES

It has been said many times, "Too late we get smart." In fact, most of us resist getting smart, just as we resist understanding jigs and templates. Many of us never get past the little triangular cutout on the plan that's used to set the dihedral angle of the center wing ribs, or the block under the wing that's used to set the wing's dihedral angle.



A dial level is more a tool than a jig, but it's very handy for setting and checking dihedral angles and wing/stabilizer angles of attack, such as when you install the jig to make a set of cabane struts.

This dihedral jig was designed and built by Hans Sagamuehl, a topnotch scratch-builder. It allows both sides of a wing to be built at the same time, with the dihedral built in. It also allows Hans to build a wing with a flat center section. Rather than use hinges, he blocks up the tip ends and affixes the center(s) in place using wood screws. Use a dial level to set the dihedral angles or calculate them using this formula: height at the block equals the distance from the center, times the trigonometric tangent of the dihedral angle. The tangents for the most used dihedral angles are: 1 degree—0.0175; 2 degrees—0.0349; 3 degrees—0.0524; and 4 degrees—0.0699.



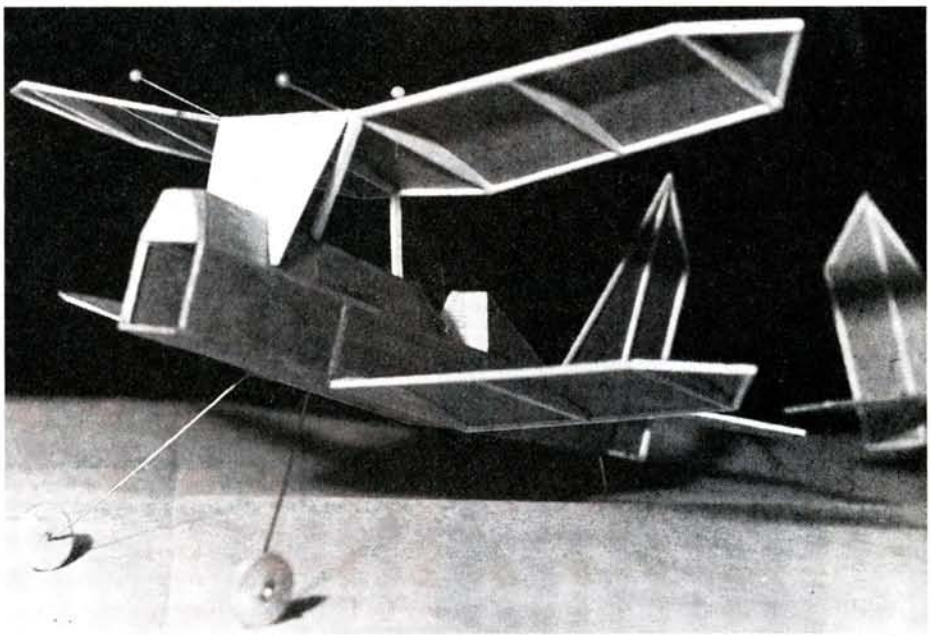
Use large triangles and squares to ensure accuracy. They can be scratch-built using thin plywood or plastic. The one shown here was a lucky find at a yard sale.

Some kits that claim to be "self-jigging" have egg-crate wing construction in which the ribs and spars fit together using machine slots and in which fuselages have machine-cut notches and slots so the pieces fit together at the proper angles. These kits are recommended; however, check to see that the balsa (or other material) in the kit is straight and warp-free before you start assembly.

Jigs are a mainstay for most scratch-builders. Learning to appreciate how much they can do to make models turn out great, rather than mediocre, is a scratch-builder's rite of passage. Perhaps we are slow to appreciate jigs because our early experiences with kits made us feel everything would turn out right if we assembled them carefully. Furthermore, our lack of appreciation may be because of our innate laziness and faith that all will be right if we "hold our mouths right" and "eyeball" the structure well while building it.

WHAT'S IN A NAME?

Jigs are defined as "devices used as guides for tools or as templates." This (dictionary) definition needs some modification when it is applied to model airplanes. *Jigs* are devices that are used to position structures when they're being constructed and/or mounted on a model. Those who have tool experience may know that a *fixture* is an industrial term that refers to a permanent jig usually made of hard metal, and a *template* is a thin metal, plastic or paper/cardboard guide that's used to cut accurate copies of a model

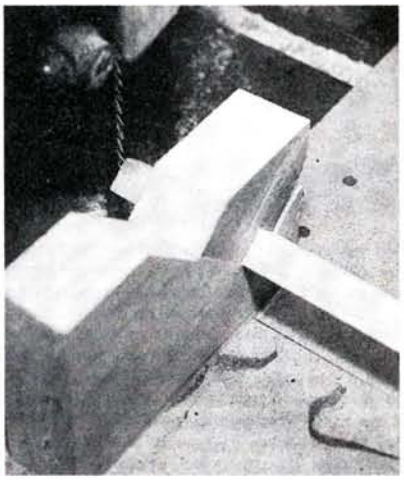


Cabane and interplane strut jigs are essential to properly mount and set the incidence of top wings. The photo shows this principle applied to a small, rubber-powered model. To make cabanes, lock the wing in place on the fuselage and build the struts between the wing and fuselage. To make interplane struts, lock the wings in place by pinning pieces of sheet balsa between them, in front of the leading edges and behind the trailing edges. Then construct the struts and put them in place.

part. Templates are often called *patterns*. Most frequently, they are used to make ribs, bulkheads and formers; however, they may be used for other tasks, such as defining the shape of wooden blocks and other parts of the model's structure.

JIGS

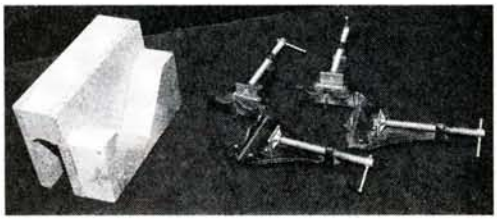
There are two basic types of jigs. The first solves a particular problem, such as building the cabane struts for a biplane. The second can be used for many different aircraft: typically, this is a hinged, adjustable dihedral jig. Single-purpose jigs may appear to be a great deal of work, but they can make the difference between a good-looking, accurate model that flies well and a sloppy model that doesn't.



Triangular balsa for fillets and bulkhead braces is relatively expensive. Two 1/2x36-inch pieces of triangular stock can be cut from one piece of 1/2-inch-square stock. The jig shown here is simply made of pieces of 3/4-inch pine (or a similar wood) and is used with a band saw or jigsaw. I made two; one for 3/8- and one for 1/2-inch-square stock. Note that thinner pieces of triangular stock can be made by cutting the square stock off center.

Reusable jigs are special devices that should last for many years. They can be scratch-built or purchased and, if carefully chosen, are well worth the investment. Shop around and find the one(s) that work the best for you. Magnetic jigs are expensive, but they work well.

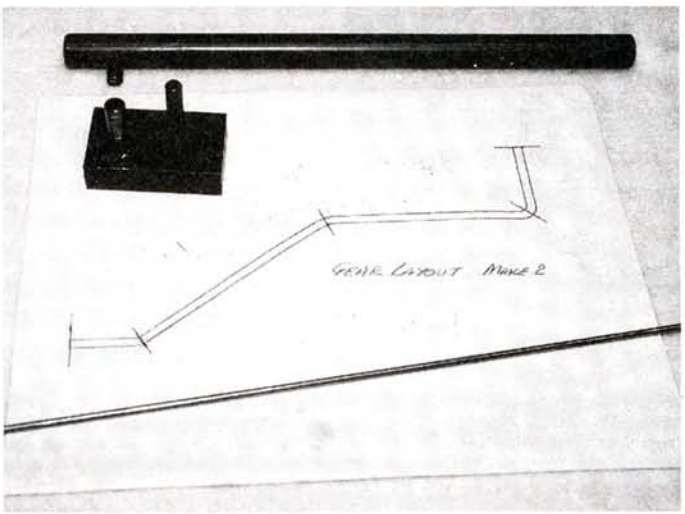
To ensure accuracy, jigs should generally be built either large or long. Consider an 1/8-inch error in a dihedral jig: if the jig is 6 inches from center to end, the error will be 1.2 degrees—a large part of a 3-degree dihedral angle. If the jig is 24 inches from center to end, the error will be 0.3 degrees—not enough to be concerned about, especially if it's the same for both wing panels. When you set the dihedral of a wing panel, it's best to block it up near the tip. Hans Sagamuehl's universal dihedral jig (shown in one of the photos) is a good example of a versatile, reusable jig.



It's best to purchase corner jigs (such as the one shown here) at a hardware store; they're inexpensive and will ensure that corners are at right angles.

TEMPLATES

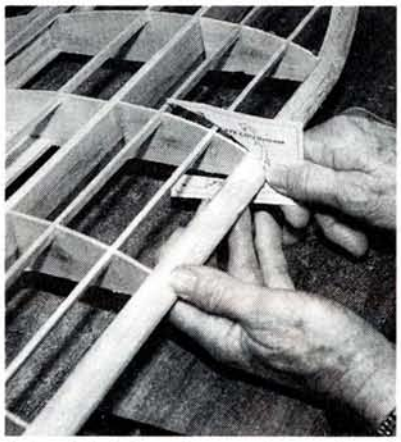
There are many ways to duplicate the ribs used in a wing or tail surface. Most, if not all, of the ribs for a straight (not tapered) surface are alike and can be stacked and cut with a band saw or jig, or sanded to shape. Regularly spaced ribs for tapered surfaces can be cut by stacking the blanks, placing a hard template on each end of the stack and cutting the excess outside the templates—neat, quick and accurate. Bulkheads/formers for tapered fuse-



Layouts/templates for landing-gear wires ensure that both are alike. If you plan to make several similar gears, a set of grooves or slots in a piece of hardwood is recommended, as is a wire-bending tool such as the one shown. If you use a vice and pliers to make the bends, make sure the vice's jaws have generous radii on their edges (sharp bends break more easily). Angle-iron that has been rounded on a grinding wheel (or filed) can be used as jaw inserts. Note that only one side needs to be rounded.

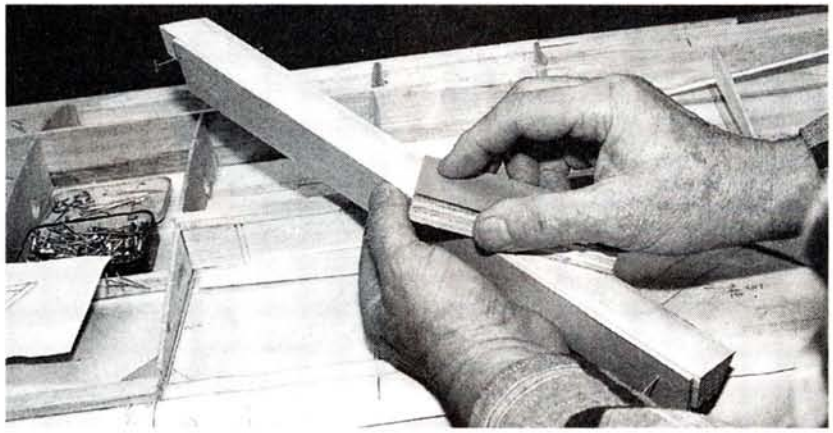
lages can often be done the same way. If the spacing isn't regular or the fuselage has complex curvature (which is frequently the case), a set of templates is necessary. If you're building from a plan, the shapes of the bulkhead and formers should clearly be shown on it.

I prefer to trace the bulkhead drawings, glue the tracings to card stock and cut them out for use as templates. Tracings are best when made of vellum



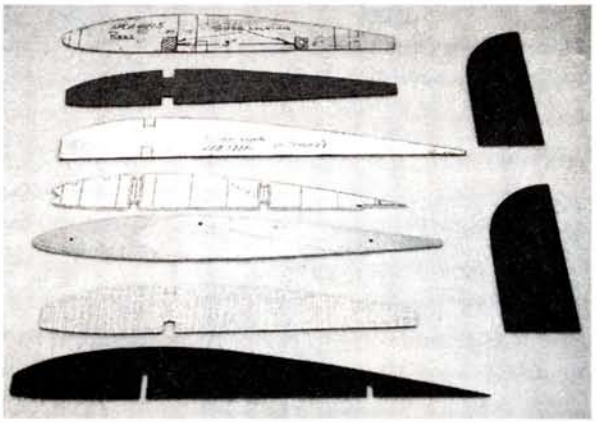
A template helps when you plane and sand a wing's leading edge. Since this template is often used only once, it can be traced or copied from the plan, glued to card stock and cut out with scissors or a no. 11 blade. When shaping it, check the curve frequently. For sport and trainer models, the curve doesn't have to be precise.

or a similar tracing material. The simplest way to "trace" templates is to photocopy them. Templates can be roughly cut out, glued to the balsa sheet and trimmed to final size when the bulkheads/ribs are cut to size. I prefer not to cut templates from the plan (or to build over it). If the plan is kept tacked to a close-by wall during the building process, it will live to serve another day.



Some jigs are very simple. This one ensures that the angle on the edge of a piece of 1/8-inch sheet balsa is correct. A piece of wood was cut to the correct angle on a bench saw. The 1/8-inch sheet was pinned to it, then planed and sanded.

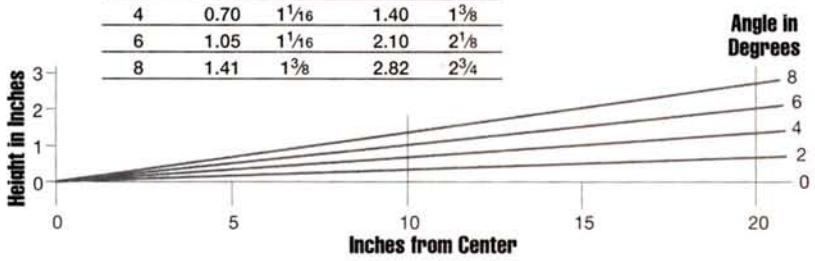
Templates are also useful for shaping balsa (or other wood) blocks. Trace the side and top views and glue them to the block you're going to carve. With a band or jig saw, cut the side to shape. Then, tack-glue the pieces you just cut off back onto the block. Now, saw the top shape and remove the tack-glued top and bottom pieces. The remaining work with a plane, knife and sanding blocks is quite easy; you'll be an expert after a couple of practice runs. If you want to hollow the block, split it in half with a saw, and then gouge out the inside using a hobby knife gouge blade (or similar). Normally, the inside won't require any precision work, but it should accommodate anything that's inside or goes through the block (like the engine or muffler).



Rib templates are best when made of thin, aircraft-grade plywood, plastic such as Micarta countertop material or sheet metal. My favorite is countertop material from the scrap bin at a kitchen cabinet shop. This material is smooth on one side and rough on the other, which helps the cement to hold better. When used rough-side-down against balsa, it stays put as you cut around the template. If you stack balsa and cut many ribs at once using a band saw or jigsaw, a paper template is adequate. Pin the template and the stack together using T-pins. Bury the pin heads in the balsa to make the bottom of the stack flat. When the outline of the stack has been cut, proceed with the spar notches. After a notch has been cut, slip a piece of spar material into it so the stack remains aligned.

APPROXIMATE HEIGHT

Degrees	AT 10 INCHES Decimal	AT 10 INCHES Fraction	AT 20 INCHES Decimal	AT 20 INCHES Fraction
2	0.35	3/8	0.70	3/4
3	0.52	1/2	1.04	1
4	0.70	1 1/16	1.40	1 3/8
6	1.05	1 1/16	2.10	2 1/8
8	1.41	1 3/8	2.82	2 3/4



Heights for blocking up wings for various dihedral angles are shown in the graph. Approximate decimal/fractional heights at 10 and 20 inches are shown in the chart. Dihedral angles aren't critical. Use the small cutout angle given on many plans to set the angle of the center rib, but don't use it to set the dihedral angle itself. Be careful to double the "dihedral-each-side" amount if you are raising only one wing.

CONCLUSION

One of the sure signs that a modeler is ready to progress from kit assembling to scratch-building is his interest in devising jigs and templates. In fact, building jigs and templates can become an interest that's enjoyable in itself! It certainly will greatly improve your models.

SR Because the best radio gear... ...is no better than its batteries!

Most of you have heard of SR Batteries. You've probably even heard that we make great battery packs. However, you've probably also heard that our packs are more expensive than the packs from "the other guys."

Well, it's true. We are more expensive... because we're better!

For over 15 years we've made the best custom packs you can buy. We've done it because we're modelers and we want to be proud of what we do. We also want to save you some airplanes.

You're probably not aware that most of SR's business is in the military/aerospace industry. Our customers include NASA, Lockheed, Boeing, the Army, Navy, Marines and Air Force, the Jet Propulsion Laboratory, The Hubble Space Telescope, the Space Shuttle Program, the Mayo Clinic, Johns Hopkins University, AeroVironment, and the Harris Corp. to name just a few.

We're really proud of our newest project. SR was selected as the only company to make the emergency backup battery packs for Northstar's new M3, IFR panel mount GPS for General Aviation.

You're probably wondering why we make packs for the R/C field when we have so much to do for the military/aerospace industry. It's simple. The President of SR Batteries, Larry Sribnick, has been a serious modeler for well over 40 years. To him, your aircraft is no less important than any of the other projects we work on. We try to employ modelers whenever possible and the cardinal rule is, "If we wouldn't feel comfortable about using a pack in one of our own airplanes, we don't let it get out the door!"

OK, it's time for specifics. What does SR do in making a pack that no one else in the R/C field does?

All SR cells are *screened and matched Aerospace Grade cells*. These are not your usual consumer type inexpensive cells. They are exactly the same cells we use for our military/aerospace applications.

Only SR *guarantees* its cells and packs not to ever form a memory and warranties each pack for one year.

Only SR puts *every* pack through five days of electronic testing to make sure every pack is perfect. These tests include a test of capacity, charge retention, and a vibration test for mechanical integrity.

All *welded* internal and external construction. Would you believe that some companies sell cells where the internal connections are nothing more than a press fit? We don't even have soldered connections, except for the connector leads themselves.

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All SR packs give you more flying time with less size and weight. Our packs are continually growing in capacity while shrinking in size and weight. Our 1000 Series receiver pack, for instance, is smaller and lighter than the standard 500mah pack that comes with many new radio systems, but it has twice the capacity and flying time.

No other company gives you the range of receiver and transmitter packs that we do. We never have to try to "fit a round peg into a square hole" because we don't make a particular size cell. Our cells range from 50mah to 10,000mah in capacity.

Custom packs. Now, that's what we're all about. While other companies force you to buy what they make, we sell you what you want. A 5 cell pack rather than a 4 cell pack? No problem! 36" leads on the pack? No problem! A special shape pack? No problem! A JR and Futaba connector on the same pack? No problem. You name it, we'll do it. And, normally, at no extra cost!

Did you ever try calling the "other guys" with a technical question? Did anyone there have any idea of what you were talking about? Only SR maintains a Hotline phone number, 516-286-0079, where you can call for help with any R/C problem or question, battery related or not!

Using SR packs, thousands of contests have been won, national and world records set, and national championships awarded to modelers around the world. A short list of just some
of our customers would include: Bob Aberle, Joe Bridi, Dave Brown, Byron Originals, Hal DeBolt, Bob Dodgson, Dr. Walt Good, Robert Gorham, Dick Kidd, Ivan Kristensen, Don Lowe, Eloy Marez, George Myers, Dean Pappas, Dave Platt, Nick Ziroli, etc., etc.!

If you'd like more information or have a question, drop us a note at SR Batteries, Inc., Box 287, Bellport, NY 11713, Fax: 516-286-0901, Email: 74167.751@compuserve.com or call 516-286-0079 between 9am and 5pm Monday through Friday, Eastern Standard Time.

Remember, *the best radio gear is no better than its batteries!*

-ADVERTISEMENT-

Several ways to get your glider airborne

SAILPLANE LAUNCH METHODS

by MIKE LEE

FOR THOSE who are just getting into thermal soaring, it can be a bit puzzling to figure out the best method of getting your aircraft airborne. Obviously, you need a system that gets you high enough for a decent flight time but isn't too expensive to purchase nor too sophisticated to handle. Let's look at the typical options available to the modeler for getting the bird up into the wild blue.

The most inexpensive method of launching your ship is called a "hi-start." This is basically a length of surgical rubber tubing (anywhere from 50 to 100 feet long) attached to 200 to 300 feet of high-strength braided string. At first glance, it may seem that this system will violently catapult an aircraft to an early death; however, it is actually one of the more gentle methods of launching a sailplane.

The next most economical method of launching is to use a hand towline. As the name implies, you attach a launch line to the aircraft the same way you did with the hi-start, only in this case, a person pulls on the line to create the tension needed for launch. Obviously, this is a two-man procedure. If it sounds like a bit of work, it is. And, while this method is rather low-cost, it is also the most violent method of launching. The amount of tension a man can produce while pulling the line in a full run is enough to snap even the very strongest of wings.

The most popular method of launching a plane is the electric winch. Although not a cheap system (typically $350 without a battery), it is very dependable, strong and easy to use. A winch system is fairly simple: a car starter motor with a spool or drum attached to its shaft is mounted to a frame. Power is provided by a deep-cycle 12V battery and energized through an automotive solenoid. The solenoid is activated by a foot pedal. Step on the pedal, and the motor spins up immediately to about 2,000rpm.

Another unique and fascinating launch technique is called "aerotowing," and as the name implies, your plane is towed into the sky by a powered plane. This is the most realistic method of getting airborne, and it requires practice to perform consistently. In simplistic terms, a large, powered aircraft with a towline attached is used to pull a sailplane behind it to release altitude. Two pilots and at least two ground crew members are needed to safely use this system. A releasable towline system on the sailplane is a must, and many of the towing aircraft also have a release system in case the sailplane runs into difficulty.

In this system, the two aircraft pilots must remain in close proximity to each

A pilot and launch person prepare for a winch launch, with the launch person handling the winch through a foot pedal. This is a safe method for most pilots who have little experience with winch launching. The winch person releases the plane with a good forward throw.

other during the towing portion of the flight. As the tow-plane begins to roll for takeoff, the sailplane is allowed to trail behind. Once both planes are airborne, the sailplane pilot must not only maintain a position behind the tow-ship, but also maintain line tension. Slack in the line may jerk the tow-plane off course with a resulting loss of control. Done correctly, it is a smooth and beautiful marriage of two planes to accomplish a high-altitude launch.

A variation of this concept is to piggyback the sailplane on the top of the tow-plane. It's the same idea as used by NASA to transport the shuttle from California to Florida after landing at Edwards AFB. In this system, a launch rack, or cradle, is affixed to the top of the tow-plane. With the sailplane nestled on top, a release system is placed over the wings of the sailplane to keep it in position during powered flight. In this case, the sailplane pilot does not have to do any flying while attached to the tow-plane. When proper altitude has been reached, the tow-plane pilot releases the sailplane while both are in a gentle dive. The sailplane normally pulls up and away for separation.

Certainly, there are other methods of getting a sailplane in the air, but the most popular ones remain the hi-start and winch. So let's discuss a bit more about both.

WATCH THOSE WINGS

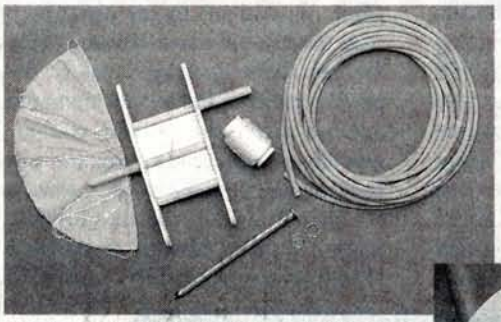
With winch systems, tapping on the foot pedal is something akin to toe-tapping in harmony with the tempo of a song. A slow song tempo relates to a lightweight, lightly built plane on launch. You go slow and easy. Winching a heavy bird with robust construction is like jamming to the sounds

PHOTOS BY MIKE LEE

HI-START LAUNCHING

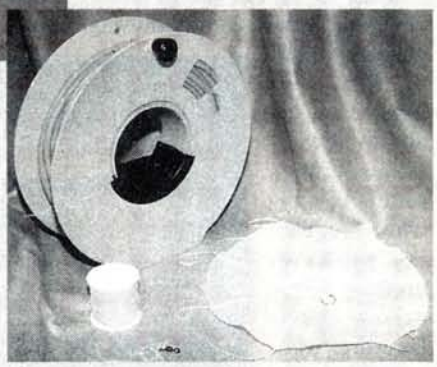
Commercially available hi-starts are excellent in quality and save the hassle of making up your own system. Depending on the size of your aircraft, you can purchase a hi-start for almost every class and size of plane.

Lightweight trainer planes designed for new sailplane pilots are normally in the 2-meter size class, and you need a 2-meter hi-start. Standard-size hi-start systems are for strong 2-meter planes to larger planes weighing up to about 50 ounces and spanning around 100 inches. Open-class hi-starts are for the seriously strong 2-meter ships and up to 120-inch birds with medium weights of around 65 ounces. With the new generation of high-tech sailplanes, even an open-class hi-start may not be enough to get effective launch height, and I have seen pilots use two open-class hi-starts as a single launcher for achieving effective launch altitude.



The Pinnacle High Start from Northeast Sailplane Products* is a full-length launch system. You'll need up to 600 feet of open field to take full advantage of this system (courtesy of Northeast Sailplane Products).

The overall length of a hi-start will partly determine how far back you can stretch the line. For a lightweight ship like the Goldberg Gentle Lady, 6 to 8 pounds of tension is sufficient. Larger and heavier models will obviously require more. Once the line has been stretched, the aircraft's tow-hook is attached to the tow-ring on the hi-start. From here, you perform a quick flight-surface check to make sure all is working correctly and then toss the plane forward toward the staked end of the launch line. You will find the upward climb to be fairly gentle and easy to accomplish. Line strength on a hi-start is between 50- and 100-pound test strength.

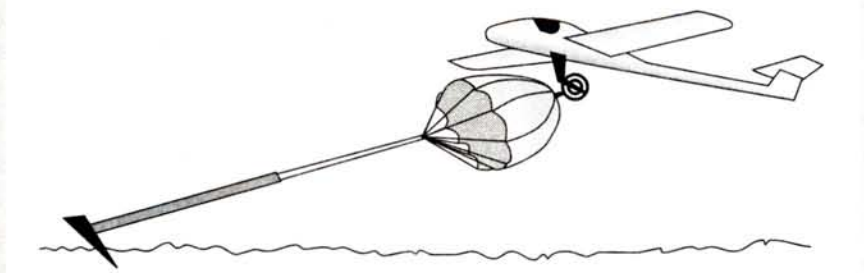


This is the Global Hobbies* Uplifter—an inexpensive and uncomplicated way to get your glider into the air.

HI-START TENSION

My technique for figuring out how much tension to have on the hi-start for a good launch is to lay out the hi-start without tension on the ground with the parachute and tow-ring end lying downwind from the staked end. I start with 20 paces, hook up the plane and throw. Notice, I did not say "release"; I said "throw." I fly the plane and then land. From here, I step back another five steps and launch again. I step back another five steps each time I launch until I feel comfortable with the altitude I achieve. Don't get greedy and haul the line so far back the line snaps, or worse yet, the wings snap on launch. Get comfy and stay there. Concentrate more on keeping the plane straight and getting as much altitude with the launch as possible.

The angle at which you launch is important. Skilled pilots may throw their planes at an angle close to 60 degrees upward. But for new planes or pilots, aim your throw at a point only a few degrees above the horizon. It is critical to get your model going fast enough to fly, and a low launch angle will give you that. After you throw your plane, it should rotate upward to an angle of about 70 degrees all by itself. Let the bird climb, and make control inputs gently. When the line tension runs out, the plane will probably level out, and the towline will simply fall off. Fly and have a good time from here.

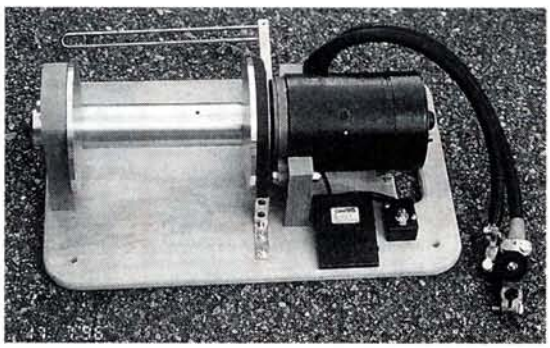


Launching a glider with a hi-start is the simplest, most economical way around. Just pull back and give it a toss.

of AC/DC. You tap hard and fast. You are looking for the right amount of line tension to get the plane up the launch with the best efficiency. So how do you determine the right efficiency? By watching the wings!

I will normally watch the wings for any sign of flexing under launch tension. This takes a good eye and good coordination with the foot. If the wings flex, I use less speed on the foot pedal. If there is not enough speed, the plane will not climb out, and by the time you realize you're going too slowly, the plane will typically fly off the line by itself. Add more speed to your foot. Whatever you do, never allow the wings to flex unless you know the wings can take it without trouble. Flexing is a sign of heavy stress in most planes. Don't stress!

Wing flexing can also be seen in hi-start launching as well as hand-towing. Again, you don't wish to flex the wings much due to stress. This is rather hard to control when launching by hand towline, as the person performing the running may not be aware that he is stressing the plane. In either case, if you feel that the line tension is too great, you can normally release the line by pulling back on the elevator stick and looping out. You can also drop the nose and accelerate past the towline; however, lightweight planes may not be able to accelerate without experiencing even heavier stress.



This winch is the type used by pilots flying F3B-type sailplanes in international competition. Although limited in its total power, it is similar to many of the sport winches in use today (courtesy of Northeast Sailplane Products).

Now, I spoke of throwing the plane on launch, and I really mean to throw ... hard! The reason for this is two-fold: one, the plane needs to go from zero to flight speed in only a couple of feet the instant it leaves your hand. This is a critical time, and without proper flying speed, the plane can take off in any direction other than the direction you intended. The second reason for throwing is safety. Should the line break or the hi-start rip out of the ground from the staked end at the moment of launch, your airplane will not have enough airspeed to fly. By throwing the plane, even if the line breaks, the plane will have forward speed from the throw to fly out safely, and you can heave a sigh of relief.

As you can see by our discussion, launching a sailplane has more than a few methods, all of which are successful. You can also see that each has techniques that require some degree of skill to accomplish and master for best results. Each is effective at getting a plane to thermal altitude. You should always seek assistance from an experienced pilot with any new system, as this assures you better chances of easy success. If you are new to this sport, check out a local sailplane club and try it out. It's always a fascinating ride.

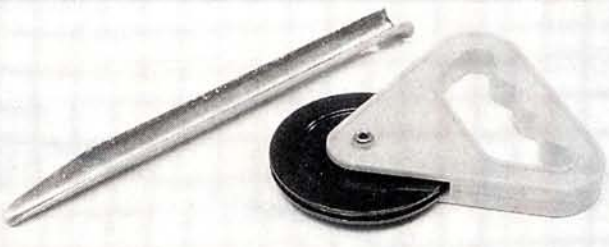
Larger, heavier planes require the pilot to throw the aircraft with enough power to carry the plane into a glide, just in case the winch lines fail.

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

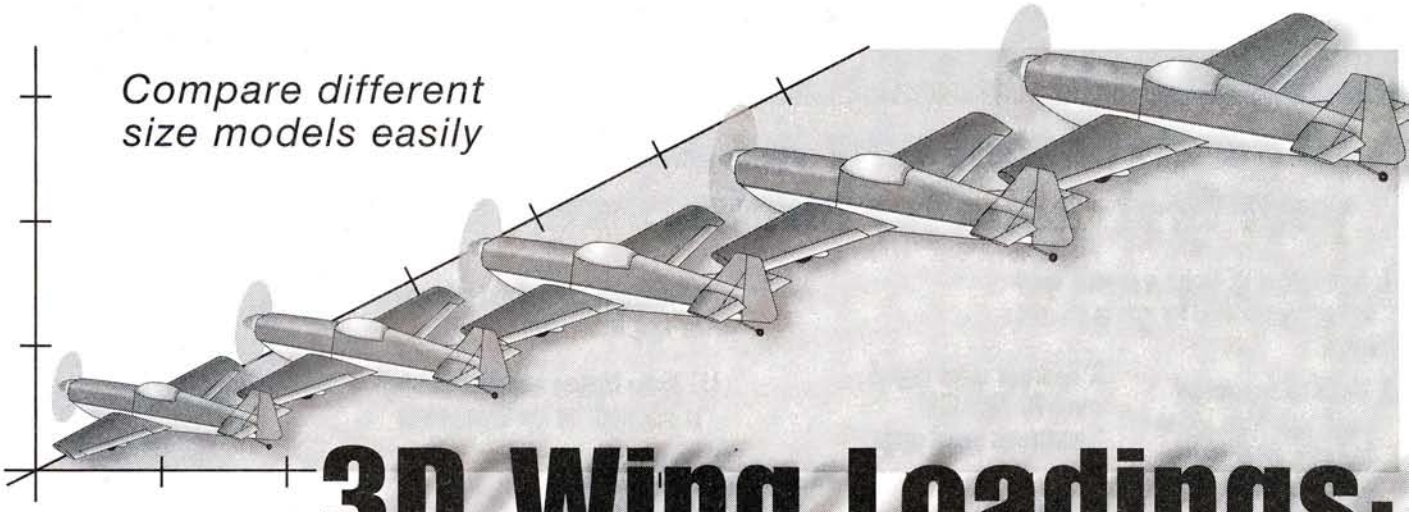
HAND-TOW LAUNCHING

In Europe, hand-towing is a very popular competition class of thermal soaring, and it is catching on slowly in the United States. You are limited on the total length of the line in a contest situation, but you may use this line in any creative fashion. According to current competition rules, the typical hand towline is 150 meters long. The rules do not specify how this 150 meters of line has to be used. The classic method is to simply roll it out and have the plane on one end while the person pulling the line hangs on to the other and runs like the dickens! Most competitors will stake down one end of the line and tension the line with a handheld pulley. While this effectively doubles the line speed, it also effectively doubles the tension you can achieve; this is why the aircraft being towed should be quite strong. Line strength of this launch system is around 125- to 150-pound test, and topnotch competitors use monofilament line. The nature of the monofilament allows the line to stretch and catapult the plane off the line on release. This extra speed is immediately traded off for an increase in total altitude.

Launching with the hand-tow is, again, similar in technique to winch and hi-start launching. To tell the runner when to begin towing, the pilot raises his leg, goose-step style, and then hangs on while the runner takes off. As in winch and hi-start launching, the pilot builds up tension and then throws the plane into the launch. The dismount from the line is also similar, only the release is made just slightly earlier to take full advantage of the airspeed gained on launch.



This is the Hobby Lobby* Hand-Towing Hi-Start pulley system. Quite simple; you simply drive the stake into the ground and feed the line through the handheld pulley.



3D Wing Loadings:

a Better Way to Scale Models

by LARRY RENGER

It's common knowledge that it's important to have your model weigh a certain number of ounces per 100 sq. in. of wing area, right? Various wing loadings have been specified for this type of model and that type of flying. Debates over an ounce per square foot here or there can become pretty heavy.

Unfortunately, those debates are trying to resolve conflicts that are due to inadequate theory. Wing loading, as generally used, is very limited in the range where any given loading is valid. There is a much better way to evaluate the weight of a model and compare it to others. A really powerful theory will let you target the correct weight for a new model based on larger, smaller or different design models.

Happily, such a theoretical solution exists and works well.

BACKGROUND

Way, way back in August 1959, Ron St. Jean published an article called "Wing Loading is Three Dimensional," right here in *Model Airplane News*. This was before R/C really got going, so he was talking about scaling free-flight models. His article is still valid today. The basic concept is that when you go from a large model down to a small one, there's a way to determine the correct weight, despite all the changes to structure, power, etc. Ron's article showed that there was a valid mathematical relationship among all the various sizes of his "Ramrod" design. These models ranged from an .020 powered miniature at 3 ounces with 150 sq. in. area up to a monster .32-powered, 34-oz., 750-sq. in. version.

By conventional wing-loading measures, his models ranged from a wing loading of 2.88 oz./sq. ft. for the .020 model up to 6.53 oz./sq. ft. for the .32-powered one. The key, though, is that the models all performed about the same! Hmm; what's going on here? By the "3D" formula that Ron used, the loadings came out the same within 3 percent! That's a little more like it, no?

The problem with classic wing loadings is that they are only valid for comparison of models in a very narrow size and design range. If, for example, you scale a Lazy Bee to double size, what should it weigh? It turns out that the weight can go way up over what the "2D loading" for the standard Bee can handle without losing its delightful flying characteristics. Similarly, how would you compare a Sr. Telemaster to a half-size Lazy Bee? How about comparing a 7:1 aspect ratio, 1½-meter, R/C hand-launch glider to an unlimited with a 12:1 wing? A theory of scaling that works correctly should allow such comparisons.

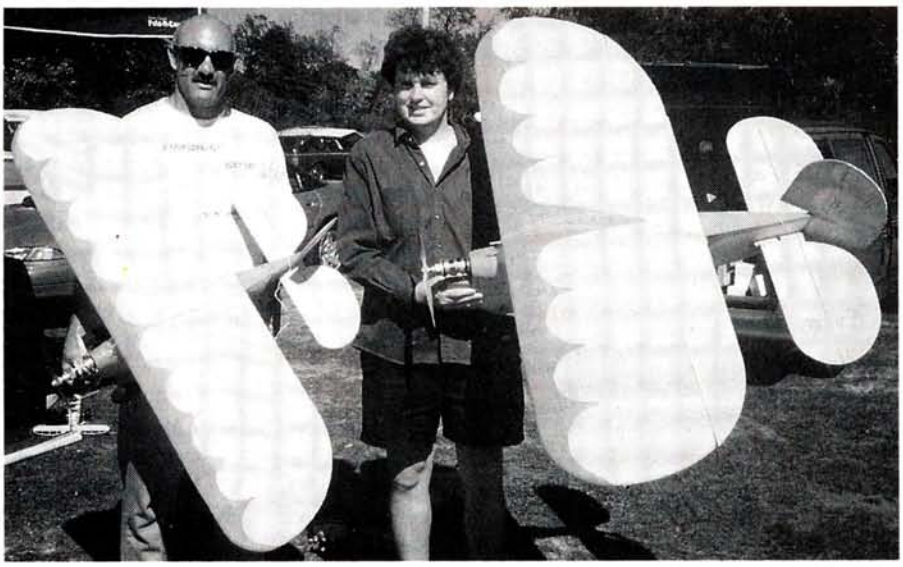
An unknown modeler with his .020 Bumble-Bee. Believe it or not, this has the same 3D loading as the big Electric Bee that has almost 10 times the wing area! By the way, Andy Clancy would love to contact this gent.

PROBLEM DEFINITION

To understand scaling and comparison techniques, you must first get a handle on what you're trying to do. In scaling a model from one size to another, you want a model that looks as if it is flying like the original one. There are other possible goals in scaling, but it seems to me that this one comes closest to what most people want. Mind you, this is a goal; reality will be discussed later.

To make one model seem to fly the same as another, each model should fly the same number of wingspan lengths forward, the glide angle should be the same, the landing speed should seem similar, and the turn radius should be the same number of wingspan lengths. From this we should be getting a bit of an "Aha!"; big airplanes fly faster than small ones! Big airplanes fly bigger maneuvers than small ones and can land faster, too, without being unmanageable.

Reality check: it's not possible to actually achieve perfect scaling of performance when scaling models downward; the small model carries too big a burden in R/C gear and hardware, Reynolds number extremes, and stability changes. The stability of a small model will be less smooth than that of a big one because the damping changes as the square of tail moment and wingspan. That is, a small model will respond more quickly and damp out more slowly than a big plane. Finally, the wing loading theory here does not take Reynolds number effects into account.



Andy Clancy on the right with a Big Electric Bee; Elliot Bouroughs on the left with a standard size Electric Bee. Scaled 1.5 times the standard, the big one's weight calculates out just right with 3D wing loading but is way off with conventional wing-loading values.

However, you will find that the accuracy of comparison from large to small, or the reverse, is pretty darned good—way better than classic wing loading. This technique will also allow valid comparisons between very different model designs in different sizes.

The following analysis is run in two parts. The first shows how to derive a wing load factor from existing models; the second shows how to use that factor to evaluate or design another model.

THE SOLUTION(S)

There are several different equations that are all valid for dynamically similar models (scale up and down of a single design). When you want to compare different designs, one equation seems to be more useful than the others.

OK! From the classic lift equation (lift = $1/2rV^2S_wC_L$), it can be shown that for scaling identical designs, one mathematical solution is:

eq. #1

$$\text{weight} = k_1 \times \text{wing area}^{3/2}$$

where "k" is a constant that is determined from your basic design. That little "1" after the "k" is just there to differentiate the constants from one possible equation to another. That "3/2" exponent on the wing area means either "cube of the square root" or "to the one and a half power." Either way, it is duck soup to solve with an inexpensive scientific calculator. This, by the way, is the "cubic wing loading" equation that Ron St. Jean used. It is simple but lacks the ability to compensate for design variations and also needs a scientific calculator to solve.

An alternative equation that takes the wingspan into account is:

eq. #2

$$\text{weight} = k_2 \times \text{wingspan}^3$$

GLOSSARY

Acceleration (a): the rate of change of speed of the model in a maneuver. This is related to the speed and turn radius.

Airfoil thickness: the distance from top surface of the airfoil to the bottom at a given position on the chord. Usually, we only look at the thickest point, and specify that as a % of the chord distance.

Aspect Ratio: the ratio of wingspan to average chord.

Camber: the curvature of the center line of an airfoil's thickness profile.

Chord (c): the distance from the leading edge of an airfoil section to the trailing edge. In this article, we are only interested in the effective average chord for the whole wing.

Coefficient of lift (CL): a factor related to airfoil type and angle that allows calculation of actual wing lift.

Constant (k): a catch-all letter to stand for any number that doesn't change.

Density (r): a mass/volume measure.

Drag (D): the force resisting forward motion.

g: the free-fall acceleration of objects at the Earth's surface.

L/D (lift to drag ratio): this determines glide angle and also the speed for a given amount of power available. Higher values are better.

Lift (L): lift required to support and maneuver the airplane.

Scaling factor (S): how much bigger or smaller the new plane will be than the old one.

Thrust (T): the force available to provide forward motion.

Turning radius (R): the size of a maneuver such as a turn or loop.

Velocity (V): the speed of the model relative to the air. The ground speed is unimportant to aerodynamics.

Wing area (Sw): the area of the wing's shadow at high noon.

Wingspan (b): actual distance, tip to tip with the wing built.

Weight (W): the force downward produced by the stationary model at sea-level. Actually the model's mass times 1 "g."

This version is interesting because it deals with the volume of air affected by the model as it passes by. The volume is roughly a circle of the diameter equal to the wingspan times the velocity of the model per unit time (also a function of wingspan). It is my opinion that this version places too much emphasis on the benefits of high aspect ratio when scaling from one model design to another. I suspect that a careful review of existing models would show that the comparisons between different designs is not as accurate as we would like. Also, again, there is that pesky cube root term.

Yet another equation that has some adherents is:

eq. #3

weight = k_3 x wingspan x average chord x average airfoil thickness

This version clearly attempts to take into account the total effect of wing design.

MODEL	WINGSPAN inches	WING AREA in2	WEIGHT oz	CLASSIC WING LOAD oz/100 in2	k oz/in3
Elec. Bee	40	500	39	7.8	.00195
Big Electric. Bee	60	1125	148	13.2	.0022
Std. Bee	40	500	24	4.8	.0012
.020 Lady Bug	20	125	5	4.0	.0020
Monster Bee	80	2000	192	9.6	.0012
Sr. Telemaster	94	1330	168	12.6	.0013

Table 1. A comparison of wing loadings and 3D wing loadings for Lazy Bees of different sizes.

You can look at it as using the volume of the model's wing to calculate a model weight density. Two problems with this version of the equation, as I see it are: 1. average thickness is hard to calculate; 2. airfoil thickness is just not that good a measure of airfoil performance. For example, a thin, highly cambered airfoil will provide lift and drag very differently from a symmetrical airfoil that has the same total airfoil height. Just which height do you measure to use this equation? As shown by all the recent research by Selig and his friends, airfoils are very tricky things to deal with unless you have the specific data for your airfoil as built.

Now, finally, the equation I prefer!

eq. #4

weight = k_4 x wing area x wingspan

It's simple, easy to calculate with a regular $4 calculator, and it takes aspect ratio into account. This equation works very nicely for scaling any given type of model from one size to another despite surprisingly large variations in design. The mathematical derivation of equation #4 is given in the sidebar.

An interesting point, by the way, is that for precisely scaling a particular design up and down, all the above equations will give you exactly the same answer! Neat, huh? Only the "k" constant will change from equation to equation. The reason to select this particular equation is that in real world comparisons of a variety of designs it seems to work better than the others.

From here on, we are only going to discuss equation #4, so what was "k_4" will become simply "k." In addition, I am going to specify that this article will use the units:

Weight—ounces
Wing area—square inches
k—ounces/in.$_3$

It is interesting to note that the "k" constant is a true weight density factor.

At the end of this article, I'll give you conversion factors to use if you like other unit systems such as gm/cm or lb./ft.

CALCULATING AND USING 3D WING LOADING

Let's run through an example, just to demonstrate how to calculate 3D wing loading. In this case, we will use variations of the Lazy Bee. The basic Electric Bee shown in the photo has a wing area of 500 sq. in., wingspan of 40 in., and weighs 39 oz. By use of a bit of basic algebra, we

DERIVATION OF EQUATION #4

In the following derivation, the constant k will be arbitrarily numbered as we go through the equations. It is not necessary to worry about the real value of the final k or its subscript as we calculate the real k from a reference model as shown in the article. To begin with, the standard formula for wing lift is:

eq. #10 $$L = \tfrac{1}{2} \times r \times V^2 \times C_l \times S_w$$

For simplicity, let's set the result of all the constant terms equal to k_1.

We have decided to scale the speed and turn radius to match the new wingspan, while holding C_l constant for similar flight response, so we can set up two more equations:

eq. #11 $$V = k_2 \times b$$

eq. #12 $$R = k_3 \times b$$

And since acceleration in a turn is:

eq. #13 $$a = V^2/R$$

we can substitute V (#11) and R (#12) into the equation for "a" (#13) and get:

eq. #14 $$a = (k_2 \times b_2)/(k_3 \times b) = k_4 \times b$$

Lift required in a turn is:

eq. #15 $$L = W \times a = W \times k_4 \times b$$

So setting our two equations for lift equal to each other (#10 and #15):

eq. #16 $$W \times a = k_1 \times V^2 \times S$$

Substitute in the term for "V" (#11) and "a" (#14), and you get:

eq. #17 $$W \times k_4 \times b = k_1 \times k_2^2 \times b^2 \times S$$

Solving this equation for "W" and combining all the constants into a new one:

eq. #18 $$W = k_5 \times b^2 \times S / b = k_5 \times b \times S$$

... which is the formula that is used in the article as equation #4.

switch the equation to read:

eq. #5

k = weight/(wing area x wingspan) = 39 oz./(500 sq. in. x 40 in.) = .00195 oz./in.^{3}

Now using that technique to derive "k," let's calculate the factor for the Electric Bee, Electric Big Bee, an .020-powered Lady Bug, and the Sr. Telemaster. See the chart to compare the 2D and 3D wing loadings for this list of models. You can get an idea of their relative performance capabilities of the models based on the k values.

So, what does this tell us? Several things, actually. First, you can see that the k-factor comparison is a lot more constant than that of classic wing loadings. The 3D wing loading gives you a much more accurate idea of the performance you will get independent of size. Experience with the actual models certainly tells us that the Electric Bees will fly "hotter" than the original glow-engine-powered Bee; also that the .020 version is likely to be on the heavy side for its size. Finally, we know that the Sr. Telemaster is one of the all-time slow flight capable models. All this correlates beautifully with the k factors in the chart.

Another way to look at this chart is to now use it to judge the wing loading of new designs. We can now, for instance, specify that any electric R/C Lazy Bee of any size ought to have k = .002. Similarly, to perform in the typical fashion, a gas-powered Bee should have k = .0012. By use of the formula, you can examine either the wing load that you have, or the ideal weight for a particular plane.

As such, the .020 model with its k = .002 is too heavy at 5 ounces, and the weight needs to drop to 3 ounces to bring its performance in line with the other gas-powered Bees. However, it is easy to see that it will fly and perform about the same as the Electric Bees in the big sizes, since it has the same k as they do.

MODEL TYPE	k-factor oz/in^3
R/C Scale	.004
R/C Sport	.0018
R/C Aerobatics	.002
R/C Soaring Glider	.0004
R/C Slope Aerobatics	.0008
R/C Slope Racer	.0015
O.T. R/C	.0009
C/L Aerobatics	.0013
F.F. Power	.0006
FAI Indoor Rubber Power	.00001

Table 2. k-factors for different types of model aircraft.

Check out the fact that the k values of a Sr. Telemaster and a standard Lazy Bee are comparable. The difference in 3D loading is less than 10 percent compared to nearly 300 percent for 2D loading comparisons! Again, experience tells us that the flight "appearance" and docility of the Bee are, indeed, comparable to those of the Sr. Telemaster.

At this point it's worth saying a word or two about "Reynolds number" (Rn). Yes, Reynolds number effects exist and will affect the accuracy of simple scaling techniques, but the degradation of going from a high Rn (big model) to a low one (small model) is on the order of 15 percent and opens an entirely different can of worms dealing with optimum airfoils for different speed ranges. The effects of density factors as represented by comparing 2D and 3D wing loading are, as you have seen, more on the order of 100 percent to 300 percent, and should always be considered.

Finally, we get back to the original purpose of the article: a technique for determining the correct weight for a scaled model. In this case, let's scale the original glow engine Lazy Bee up to twice its size. With the wingspan doubled, the wing area becomes four times as big, or 2,000 sq. in. By use of equation #4, the correct weight is easily calculated to be 192 ounces. This weight correlates well with that of the smaller Sr. Telemaster.

Note first that these numbers give you an equivalent flying model. Second, the numbers for the Monster Bee look about right using 3D scaling, while if you tried to hold the 4.8 oz./100 sq. in. 2D loading, you would have come out with a model weighing only 96 ounces. A model that light and of that size would be entertaining but would fly quite differently than a standard Bee.

GENERAL USE OF 3D LOADINGS

Table 2 presents rough values of k for various types of models. Note that these were generally taken from a single, but very typical, example of the model type just to give an idea of the relative relationships. You can refine these k factors by averaging the numbers from several different sizes and designs.

You can see that the faster, hotter model types have a larger value for k. I think that if you check out some of your favorite models, they will fall very close to the values given. I would expect a good flying model to have a k within about 20 percent of that listed for its type.

There are a couple of surprises in the chart. R/C soaring gliders have a lower loading than free-flight power models; this must be the effect of the extreme aspect ratios. On the other hand, the glide of a good soaring machine is much flatter than that of a free-flight's, so I guess the numbers work out pretty well there too.

CONVERT TO:	MULTIPLY LISTED K BY:
lb/ft^3	108 (lb x in^3)/(oz x ft^3)
oz/ft^3	1728 (in^3/ft^3)
lb/in^3	.0625 (lb/oz)
stone/furlong^3	2.96 x 10^6 (stone x in^3)/(oz x furlong^3)
gram/cm^3	1.73 (gram x in^3)/(oz x cm^3)
kg/m^3	1730 (kg x in^3)/(oz x m^3)

Table 3. Unit conversion table for k-factor

UNIT CONVERSIONS

Not everyone wants to use the ounce and inch units I prefer. The following table gives conversions so you'll be able to change the units as you please and recalculate the k constant. Here are some conversion factors for "k" to change from the oz. in.^{3} used in this article to the units you want. This chart lets you take the k's from this article and convert them to your preferred system. It should take care of just about everyone, including any model-flying druids who happen to read *Model Airplane News*.

Note that once you have established your unit system and calculated your k in those units, you no longer need to apply any conversions; that is, if you start in the stone/furlong measurement system and stay there, you never need a conversion factor.

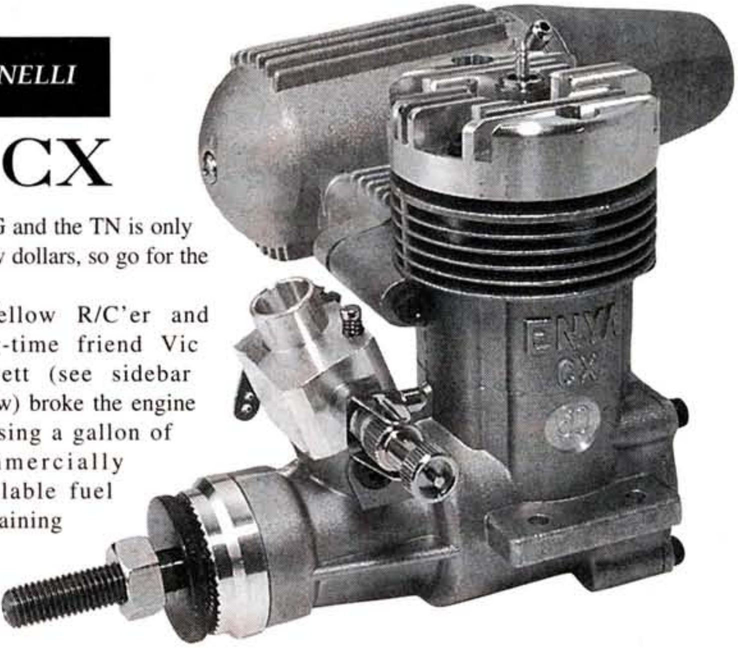
CONCLUSIONS

So, it may take a bit of getting used to, but if you use 3D wing loadings, you will have a much more useful and accurate estimate of whether your model is the correct weight. You can compare weights of different designs in a more meaningful way as the formula provides some correction for changes in aspect ratio. Finally, you now have a powerful tool to use when scaling models from one size to another in order to get an accurate estimate of the new size and weight.

Air POWER

by CHRIS CHIANELLI

ENYA .50 CX



IN THE last "Air Power," I told you I'd throw in a mini engine review every so often. Well, here's the first one—a great sport engine by one of my favorite manufacturers. Like others in the CX line, the Enya* .50CX ABC features: Schnuerle port induction, twin ball bearings, ridged single-piece cast crankcase and expansion-chamber muffler. While other engines in the CX line (.40 and .45) feature a true chrome AAC piston/sleeve technology (aluminum piston with chrome-plated aluminum sleeve), the 50, for some reason, comes with a true ABC piston/sleeve technology (aluminum piston with chrome-plated brass sleeve) and a machined head instead of a cast head.

The 50CX is available with either the G air-bleed carburetor or the TN twin-needle version. My older .45CX ran fine with the G model, but the TN is an improvement, having somewhat better fuel draw and throttle response. The second needle gives greater fuel/air mixture control at the low end, and that makes the engine much more tunable. This is particularly beneficial if it's mounted inverted for scale cowl applications. The difference between the G and the TN is only a few dollars, so go for the TN.

Fellow R/C'er and long-time friend Vic Olivett (see sidebar below) broke the engine in using a gallon of commercially available fuel containing 15 percent nitro and 18 percent synthetic/castor blend (80/20) lubricant. All rpm tests were done using APC props, and readings were taken by the super-accurate and easy-to-use TNC Sensi-Tach PT +10 tachometer.

Some obtain rpm readings with an open exhaust. Vic and I think, "What's the point?" When you read the figures shown here, remember that I aim to test engines under the same conditions as everyday sport modelers use them. I run all the tests with sport fuel and quiet mufflers—mufflers that will be accepted at even the most noise-sensitive clubs—not specialized tuned pipes. With this engine, I used the included expansion-chamber unit throughout. Like other expansion units, this one is restrictive at the top end, and readings will suffer a bit, but saving our flying sites is the priority. These figures do show practical use in the real world. "Laboratory" data definitely have a place, but not in this particular column.

Engine-vibration levels were well below average. Like the .40CX and .45CX, the .50CX is one smooth operator. Whenever I had an engine that was a "vibrator," I didn't care how powerful it was; it ended up at

Vic (left) and Chris working together.

WITH A LITTLE HELP FROM MY FRIEND ...!

I "drafted" Vic Olivett to do some of the "lab/field" work for me. Allow me to nostalgically digress, if you'll be so kind. In 1970, I stubbornly tried, all summer, to learn how to fly R/C by myself. What I learned was how to crash into everything and anything—things such as trees, boulders, corn fields, barns, county road 481, flagpoles, Packards and swimming pools. Eventually, I yielded to the logic: "Seek help, moron!"

That winter, I joined the Kingston Aeromodelers and made some lifelong friends. Among them was Vic. I was in college, and Vic was his own boss, so we could meet almost anytime for a flying lesson. Even if Vic had nothing to fly, he would come to the field to help me. I think he sensed how desperately I wanted to learn. In short, Vic had me setting up for finals in two days and landing solo inside of a week. He's a great teacher. I'm forever in his debt. Oh, yeah, I almost forgot; I've since become a much better pilot than Vic, and it really aggravates him. So if you see him at the field, please don't bring up the subject (sorry, Vic, I can't help myself).

the year-end club auction.

The .50CX was tested with Fox, Enya and Wildcat plugs, which all operated acceptably. On a Hangar 9* heli plug, however, the idle and throttle response were superb. Solidly reliable idles of 2,480rpm on an 11x7 and 2,420rpm on a 12x8 were achieved with subsequent quick acceleration to full throttle.

Construction of the 50CX, and of all Enyas for that matter, is very robust; the metallurgy is on par with that of one of the finest, SuperTigre—another of my all-time favorites. One look at this engine's beefy forged connecting rod, which is bronze-bushed at both ends, shows Enya's commitment to durability. The 5-year limited warranty, including 1-year crash-damage protection, is further testament to this manufacturer's confidence in the product.

It's no coincidence that both of these engines have fantastic metallurgy and they seem to last almost forever. Our contributing editor Dyno-Dave Gierke—Grand Master of Methanol Machines and a very difficult man to impress—has a five-year-old Enya .60XF that he says he can't kill. He told me, "Chris, I've done unspeakable things to that motor you wouldn't believe! Once, I put a flywheel on it, ran it to 20,000rpm, and it just keeps getting better! It's so reliable and easy to run." Another of my mentors, Art Schroeder—former editor of *Model Airplane News*—once told me that when he was competing in AMA pattern, he made the mistake of switching from Enya for a time. With the new brand, he ended up needing a new engine—or two—every season. He remembers getting many seasons of competition from the same Enya. He quickly switched back!

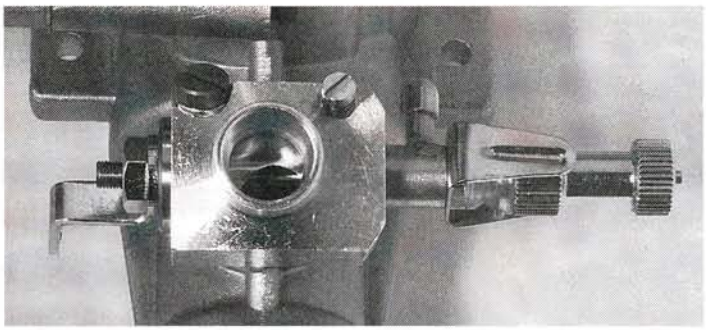
There is a flip side to this level of durability. You need to spend a little time breaking the thing in before a smooth idle, a good throttle response and top performance are realized. If you're a guy who breaks engines in while running rich in the air instead of on the bench (I'll cover that topic another time), expect to fly for about two sessions before you see the machine start to smooth out and come on in terms of power. I ask you instant-gratification types this question: isn't that a small price to pay for an engine that will last for many years? (And remember the long-term dollar savings realized by not having to "buy twice.")

So often I hear it said, "I like ... [brand X] because those engines run right out of the box!" OK; fair enough. I would, however, offer you this: don't pass over an engine because you've heard that it doesn't idle perfectly right out of the box. If you do this, in my humble opinion, you'll be missing some of the highest quality engines available to you.

*Addresses are listed alphabetically in the Index of Manufacturers on page 142.

TEST RESULTS

Prop size	Rpm	Static thrust
10x6	13,440	5.2 lb.
10x7	13,320	–
11x6	12,010	–
11x7	11,920	–
12x6	11,160	–
13x6	9,360	6.3 lb.



The twin-needle ("TN") gives precise control of the fuel/air mixture throughout the entire rpm range. The result is excellent idle, fuel draw and throttle response.

The Hangar 9 no. 3 heli glow plug worked fantastic in the .50CX. Early reports indicate it may also work as well as the more expensive O.S. "F" when used in 4-stroke engines.

MODEL AIRPLANE NEWS

PRODUCT REVIEW

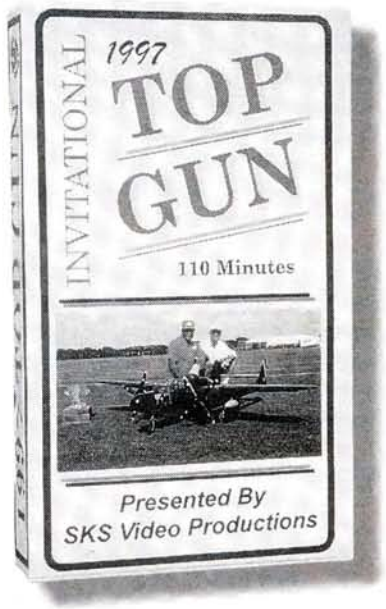
SKS has two winners!

Top Gun & Florida Jets Videos

by GREG GIMLICK

TOP GUN 1997 VIDEO

THE NEXT TIME you have an afternoon when you really want to be flying and can't, I hope you planned ahead and ordered SKS Video's* latest tape of the 1997 Top Gun Invitational. These guys have developed a method of doing films that is geared toward the modeler and gives the information a modeler needs to know. This video spans almost two hours and features about 50 of the planes entered in the event at the West Palm Beach Polo Club. It would be hard to point out just a few highlights, but watching a 16-foot B-29 weighing 100 pounds perform a rolling circle would be one that would be hard not to mention. Greg Hahn's B-25J would be another "must see" and as an example of the detailed information the video gives, you'll find out this B-25 is scratch-built from Ziroli plans, uses G-38s, has 21 servos, 150 feet of wire, 100 feet of air lines and employs a sequencing bomb release so the drop is realistic. I also learned that Walt Disney helped to produce squadron insignias during the 1940s for the Army Air Corps. This video is one of the best event coverage videos I've seen offered. Each plane and modeler is introduced along with pertinent details. The narration is clear and background noise is minimal, so there are no distractions while enjoying the flights; and each featured plane is shown in flight, takeoff and landing. This is a packed two-hour video and a "must see" if you didn't attend the actual event.



FLORIDA JETS

This year's was the first Florida Jets held at Bunnel, FL, and orchestrated by Mr. Top Gun—Frank Tiano. It's only fitting that an event like this should be documented by SKS Video using their winning formula for capturing the information and some of the atmosphere of the event. The tape runs almost two hours and features over two dozen of the 345 planes entered by the 180 registered pilots. If jets are your thing or you have even the slightest interest in them, you'll find this is like a lesson in the diversity of subjects and products available. When the action was interrupted with the first commercial, my initial thought was, "How could they?"; but the advertisements are done in more of an informational format than a sales pitch, and I found them to be a great feature of the video. About six times, you are treated to up close and personal introductions to some form of model jet product, and not once do you feel like you're being strong-armed; they are simply video brochures of something you otherwise might not learn about. The video covers everything from the familiar ducted-fan units to the more exotic true turbines running on kerosene or propane. Every era of the jet age is represented, along with some sport designs, and the awards were broken down into eras—a great idea. One of the entries from Bertrand LePoutre of France was a Rafale that even featured a firing Exocet missile powered by an Estes motor; he describes it, but we don't get to see it fired during this event.

SUMMARY

You won't be disappointed with either one of these videos and, compared to other videos I've seen, the format is the best around. Too many times I've seen videos that don't tell us which engine, radio, kit, plans, or materials were used, but not these. Each one could be used to help study and select your next scale project or teach you just what the top level competitors expect. The award ceremonies are covered very briefly and, instead of boring us with an hour of presentations, we get to see each winner and it moves on. My hat is off to Frank Tiano for his talent in coordinating great events and to SKS for knowing how to present them to us. This is money well spent on your video collection.

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

Effective PROGRAMMING

by DON EDBERG

ARE YOU COMPATIBLE?

LAST TIME, I wrote about how each brand of radio uses its own PCM encoding scheme, so the PCM receivers are not interchangeable between brands. However, it is possible to interchange some non-PCM receivers between some brands. Now's a good time to discuss why that's true.

In my last column, I described how R/C systems work and showed you how the systems translate stick position into a sequence of pulses, where the width of the pulses is proportional to the stick's position. This is called a pulse-width-modulation scheme (PWM, often incorrectly referred to as PPM and FM); the pulses encoding each servo position have a different broadcasting frequency compared with the "non" pulses. It turns out that some of the manufacturers use a lower broadcasting frequency for the pulses (also called "negative shift" because the frequency shifts negative, or down), while others use the opposite, where the pulses have a *higher* frequency. A negative-shift receiver won't "listen" to a positive-shift transmitter, and vice versa. This is why receivers won't always work with transmitters of a different brand.

You're probably interested in which brands work with which other brands. The discussion presented here, illustrated in table 1, is restricted to PWM (PPM or FM) receivers only (not AM and not PCM) in the U.S. On the North American 72 and 53MHz bands, Airtronics* and JR* PWM receivers will work with each other (although most of the manufacturers steadfastly state that their equipment should not be used with other equipment), and Futaba* and Hitec* also are interchangeable. Note that, in general, you can't mix brands F and H with brands A and J. However, there are several third-party receivers that may be purchased to work with the system of your choice (and they often cost less than the factory receivers!).

IF YOU PURCHASE A NON-FACTORY RECEIVER, OR MIX GEAR BETWEEN BRANDS, BE SURE TO VERIFY ADEQUATE RANGE BY CARRYING OUT A RANGE CHECK! Neither this author nor this magazine is responsible for any results, good or bad, that may occur when you mix radio gear between brands.

That being said, a few manufacturers make provisions for their transmitters to be used with other brands of receivers. For some time, the higher-end Hitec systems provided a software command to change the frequency deviation so they could be used with Airtronics and JR receivers. More recently, the Airtronics Stylus also provides this "PPM-invert" option (it inverts the shift direction) to do the same thing. As far as I know, JR and Futaba do not provide this option.

For U.S. hams only, Airtronics, Futaba and JR all use the same deviation for 50MHz (*not* 53MHz), so any 50MHz PWM receiver will work with all three of these brands.

As I said before, you must do a range check before flying with mixed gear. Of course, this is also true for flying with the same brand of gear! I recommend that you do it before each flying session as well as after a hard landing, if you feel the gear has really been shocked.

To do a range check, you need to find a relatively open area with no metal structures nearby or buried in the ground. Place the model on the ground with its nose toward or away from you (this is the position with worst reception, or minimum range). Collapse the transmitter antenna, turn on transmitter and receiver, wiggle the controls, and choose a control surface that may easily be seen moving from a distance. Then, with the transmitter antenna fully collapsed, slowly back away from the model until it begins to act strangely, the servos get nervous, or the controls don't respond (if you have a PCM receiver, you can set the fail-safe to go to a particularly visible arrangement). When you do lose control, walk back toward your model while you count your paces. The distance or number of paces reveals the model's ground range with a collapsed antenna. In general, this should be roughly 20 to 30 paces, but can vary a fair amount.

I prefer to do the range check in the same location each time, so I know conditions are similar and changes can only be due to the R/C system itself. I also recommend writing down the number of paces somewhere permanently so that you can

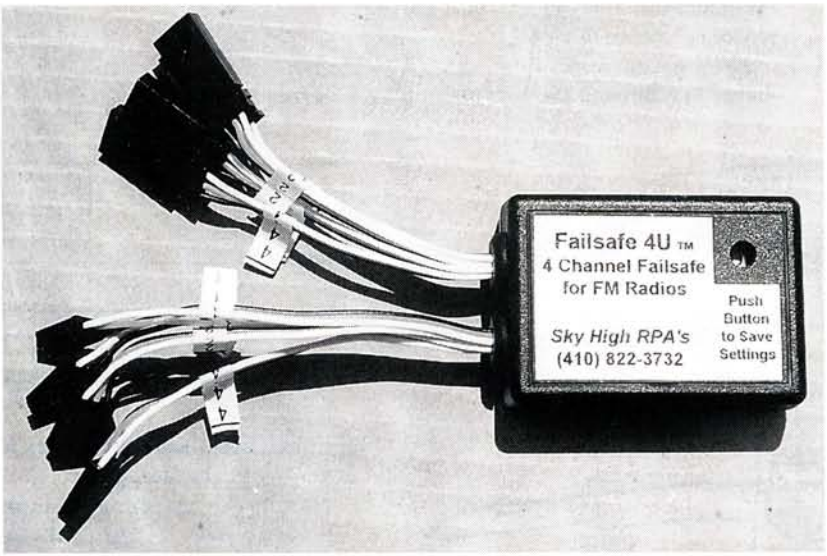
Table 1. Compatibility Between PWM ("FM") Systems on 72, 50 and 53MHz (√ = compatible)

	Airtronics Receiver	Futaba Receiver	Hitec Receiver	JR Receiver
Airtronics Transmitter	√	Stylus INV only or 50MHz	Stylus INV only	√
Futaba Transmitter	50MHz only	√	√	50MHz only
Hitec Transmitter	Prism 7X only	√	√	Prism 7X only
JR Transmitter	√	50MHz only		√

compare subsequent range tests with previous ones. If you see a radical change (usually a drop in range), then you should not fly until the situation has been investigated and the cause of the low range is understood. Often, you can get more range by removing the antenna from the fuselage and rerouting it. In extreme cases, you may have to allow the antenna to trail behind, or make a vertical (whip) antenna.

If you have a so-called "rubber duck" or shortened antenna, you can't collapse it to reduce range. In this case, you'll have to take a very long walk (probably farther than you can see the model) or use something to cut down the range. I have heard of folks putting a metal pipe over their rubber duck antennae for this purpose. The pipe should be a few inches longer than the duck antenna length.

With a few exceptions, most programmable R/C systems today use the scheme of *frequency modulation*, or FM, for transmitting. They use this method of transmission for both PWM and PCM types of encoding. This is why non-AM transmitters (both FM/PPM/PWM and PCM) can utilize the same plug-in frequency module. And almost all PWM computer radio transmitters can be made to broadcast in PCM mode very simply in the built-in software, so the only difference between radios of the PWM and PCM types is the receiver and servos supplied (and sometimes a faceplate on the transmitter's front).



This Failsafe 4U unit plugs in between your non-PCM receiver and servos and provides fail-safe functions without a PCM system! More details in text.

PCM SYSTEMS AND SERVO RESOLUTION

Last time, we learned that the PCM method of transmission converts the stick commands to so-called "digital" format—a collection of ones and zeros that represent the commands in computer language. This method converts the pulse widths that were used by PWM systems into digital format by an analog-to-digital converter and then sends them out the antenna. On 1024 systems (all new systems are 1024s, but older ones are 256 or 512), the full travel of the servo is divided into 1,024 small steps of motion. For servos with 90 degrees of travel for full motion, one part in 1,024 works out to be about 0.09°/step—an almost unnoticeable value. As you might expect, the 1024 sets have twice the resolution of 512 systems, but I have never noticed any difference. The pattern guys do seem to notice them, but you need not worry about this unless you buy a used PCM system.

Airtronics used 512 transmission until the introduction of the Stylus system in 1996. Futaba has been using 1024 transmission since 1988. By the way, JR calls 1024 transmission "Z-PCM" and 512 transmission "S-PCM." A JR PCM receiver must be matched to the type of PCM transmission indicated by the letters on the receiver. All other things being equal, you may be better off with a 1024 system, but this should not be a deciding factor—only a tiebreaker.

FAIL-SAFE WITHOUT A PCM RECEIVER?

"Fail-safe" means that the receiver commands a set of stored servo positions for use when interference is experienced. Last time, I told you that you need a PCM receiver to utilize the fail-safe function. Well, that's no longer true. I've just learned about a new product that may be of interest to those who would like to have the benefits of fail-safe systems. This new product does the same thing without requiring an expensive PCM receiver. It's called "Failsafe 4U" from Sky High RPAs; connect it between the receiver and the servos to provide up to four channels of commanded servo positions. It works with all PWM ("FM") radios.

The Failsafe 4U detects bad or lost signals and commands the servos to move to a set of positions that are input by your pressing a button while you are holding the sticks in the desired fail-safe position. The unit remembers this set of positions until you change it, even between flying sessions. If you have a gyro or autopilot unit, the Failsafe 4U will turn it on only during fail-safe operation. If you need more than four channels, you can add a second unit.

The Failsafe 4U weighs less than 1.5 ounces (42gm), measures 2.25x1.6x 0.75 inches (57x41x19mm) and consumes less than 5mA of current. It's available for $95 with a complete set of connectors, or $75 with no connectors. This is an inexpensive way to achieve the features of fail-safe without the cost of buying a new R/C system. Sky High RPAs can be reached at 8673 Commerce Dr. #4, Easton, MD 21601; (410) 822-3732; fax (410) 822-9362; email: **<sky-hi@msn.com>**.

If you write, send your self-addressed, stamped envelope to Don Edberg, 4922-P Rochelle Ave., Irvine, CA 92604, or email me at **<dynamic3@flash.net>.** I get lots of mail, so please be patient!

**Addresses are listed alphabetically in the Index of Manufacturers on page 142*

by JIM RYAN

CAD DRAWING: IT STARTS WITH A 3-VIEW

LAST TIME, we talked about using CAD as a tool for designing scale models, and we addressed the problem of getting the paper 3-view into your CAD environment as a starting point for the actual construction plans. We showed how a flatbed scanner can create an image that can then be imported into your CAD program, and we discussed the minor problems with that approach.

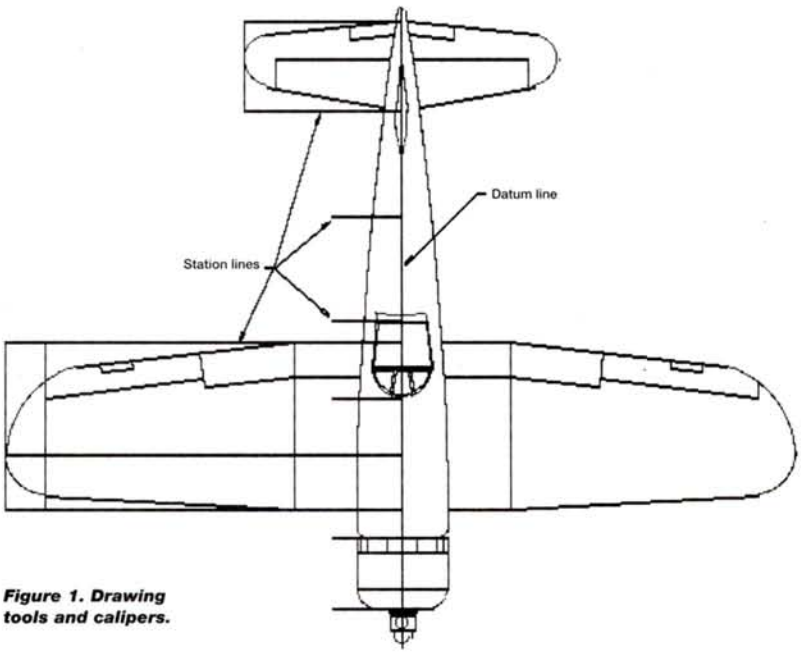


Figure 1. Drawing tools and calipers.

This month, we'll look at a second method for achieving the same end, this one requiring nothing but a ruler and a set of calipers.

DIRECT MEASUREMENT METHOD

The second way of importing the 3-view requires only the most basic of tools, and in all honesty, it's my favorite of the three for anything but the most complex projects. All that's needed is a photocopy of the 3-view, a pencil, a ruler and a set of calipers. Some triangles, circle and ellipse templates and other basic drafting tools are also helpful, as we'll see later on.

A comment on the calipers: I own both dial and digital calipers, and the digital calipers are a lot easier to use. Not only is the digital display easier to interpret, but the calipers can be zeroed on any setting and will then measure the *difference* between two measurements. This can save time and reduce the chance of mistakes.

Let's get to work: First, draw a datum line through the side and top views of your 3-view. I generally draw this line on the engine thrust line, but since it's only a reference, use whatever is convenient. Obviously, the datum for the top view should be the centerline of the fuselage, unless perhaps you're building a Blohm und Voss BV-141. Next, draw a series of station lines perpendicular to the datum. Set the spacing close enough to capture the contour of the fuselage; the more station points, the more accurate your 3-view will be, but the more time it will take to produce. I frequently vary the spacing; closely spaced near the nose, where the fuselage is more sharply contoured, and farther apart near the tail, where the contours are very gradual. Draw an additional set of station lines on the top view for the wing and stabilizer. For a straight taper wing, you only need one at the leading and trailing edges of the root and tip. For an elliptical wing or stab, you'll need to draw

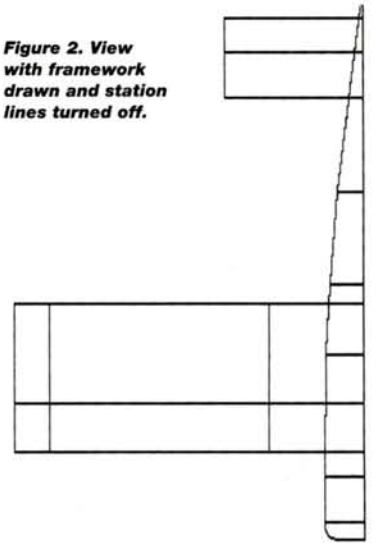


Figure 2. View with framework drawn and station lines turned off.

complete datum and station lines just as you did for the fuselage.

Now for the fun part: I like to start with the top view; it's usually the easiest, especially since you can draw half of it and then use the "Mirror" command to make the other side. Measure the length of the datum line on the 3-view from the spinner backplate (or another convenient reference) to the tail, and generate a line that length on

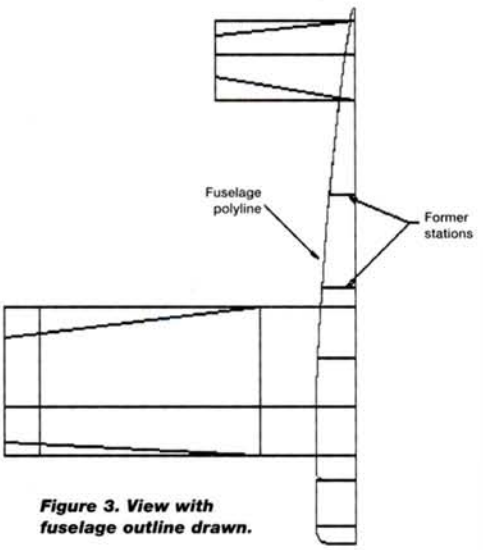


Figure 3. View with fuselage outline drawn.

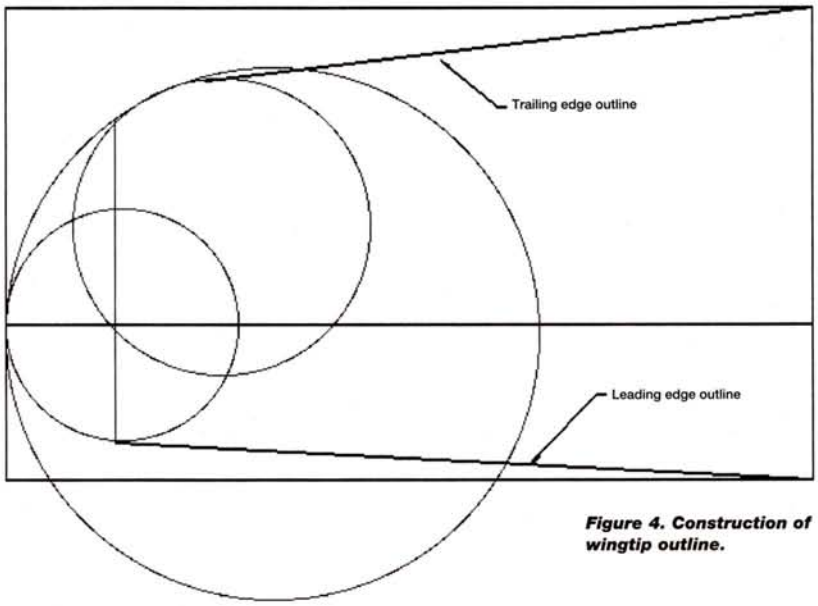


Figure 4. Construction of wingtip outline.

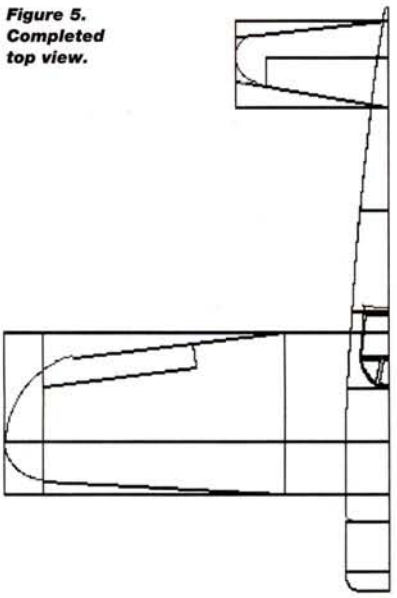
your CAD screen. Next, use either the "Offset" or "Copy" command to duplicate the spacing of the station lines you drew on the 3-view. This is the basic framework for your drawing. Incidentally, I put the datum and station lines on a layer by themselves so that I can turn them on and off when necessary and delete them when I've finished with them.

With the construction framework completed, I switch to a new layer to begin the actual 3-view. Starting at the first station line, use the digital calipers to measure the distance from the datum line to the edge of the fuselage (see Figure X). Draw a line this length in the corresponding location on your CAD screen. Repeat this process at each of the station lines all the way back to the tail, and then turn off the layer that has the construction lines to get them out of the way. Now, draw a polyline (this is an entity made up of multiple line segments that are edited together) that connects the endpoints of all the station lines. This line will have a faceted or jagged appearance because it's made up of short, straight, line segments instead of being a single smooth contour. We'll fix that in a moment. Use the "Polyline Edit" menu to edit the line into a "Spline" or "Fit" curve. Now you should have the smooth gradual curve you wanted. The curve should pass through, or very close to, the endpoint of each station line, but if it doesn't, you can edit the line or simply redo it to correct the fit. Since I usually use this method on sport-scale models, I don't worry about getting a perfect match.

Follow the same steps to draw the wing and stabilizer. Now, you'll recall that I suggested gathering a set of circle and ellipse templates, and this is one place they come in handy. Features like the wing and stab tips, cowl, etc., tend to be made up of circular or elliptical arc segments, and it's much easier to simply match the contour to one of the templates, use the "Circle" or "Ellipse" commands to create a matching object on your screen and then trim off the excess, than it is to try to match sharp contours like this with an edited polyline. With the overall outline complete, fill in details like the control surfaces, landing gear, cockpit and any other important features. Once you have half the top view completed, just use the "Mirror" command to make the matching half.

The side view is handled in much the same way as the top view. I find it easier to treat the top and bottom edges of the side view as two separate polylines, as this makes them easier to edit and adjust. Depending on its shape, the vertical fin can either be copied with edited polylines or with circular and elliptical arc segments.

Figure 5. Completed top view.



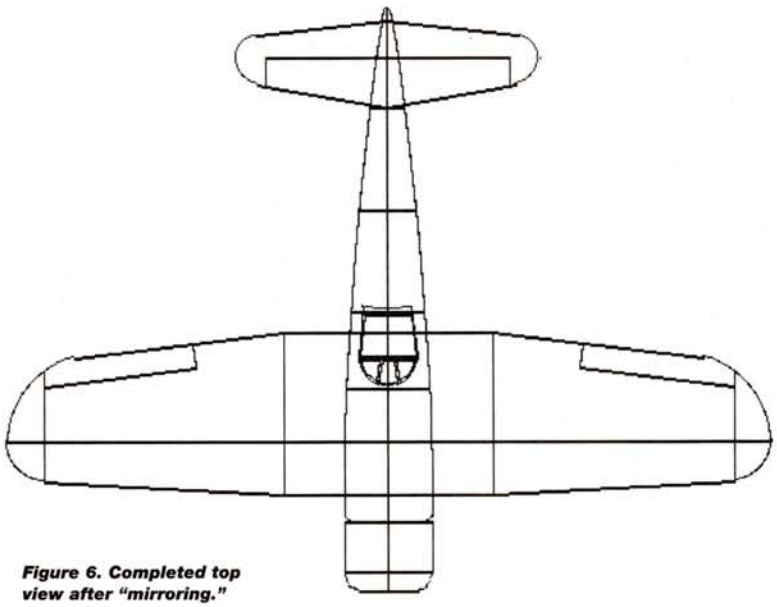


Figure 6. Completed top view after "mirroring."

The next step is to create the fuselage sections for each of your former locations. To do this, copy the station lines from the top and side views together to make a framework for each of the fuse sections. Next, draw the formers using the sections on your 3-view as a reference. Here again, the circle and ellipse templates can be handy for gauging the proper curvature. Once you've finished with this, you can copy each of the fuse sections together into a single "stack," which will give you the front view. Don't trim away the extraneous lines from this view just yet.

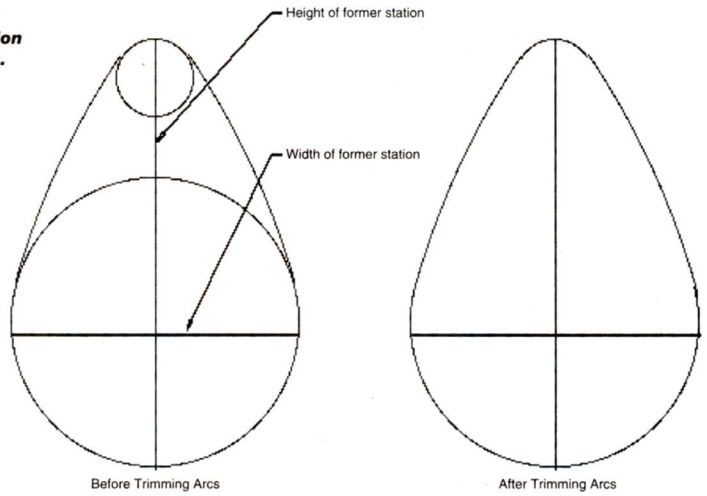


Figure 7. Construction of formers.

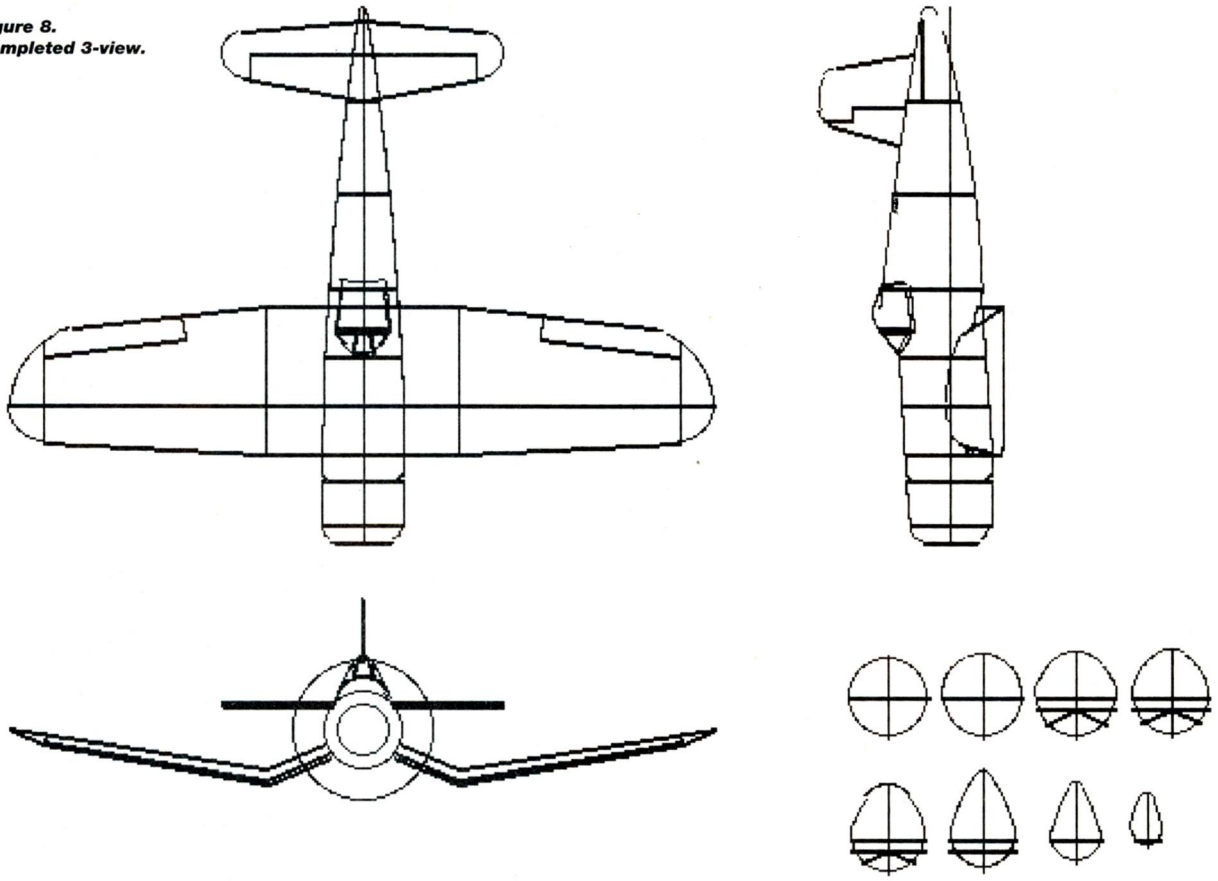


Figure 8. Completed 3-view.

SCALING TO SIZE

Once you've completed the 3-view, it's a good idea to check it for accuracy before you scale it to your working size. Make the most of this opportunity, because no Top Gun judge will ever get a chance like this. Simply print out a 1:1 copy of the drawing and lay it over your paper 3-view (if you can print on transparent Mylar, that's even better). Since they're drawn to the same scale, they should match perfectly. If there are deviations that you want to correct, now is the time to do it, either by redrawing the offending lines or by editing them with "Stretch" or "Polyline Edit" commands. If there are deviations on the front view, edit only the offending former and then replace it in the "stack." Once you're happy with the accuracy, you can clean up the front view by trimming or erasing everything but the outermost lines.

Because of CAD's many built-in capabilities, you can check the wing area, nose and tail moments and any other critical attributes before you even start the real design work. If the wing loading doesn't look optimal (or if the plane won't fit in your car!), now is the time to consider changing the size. Once you're happy with the scale, you're ready to proceed with drawing the internal structure of the airframe.

Next time, we'll look at one more method of importing 3-views, this one using a specialized peripheral that makes CAD drawing much easier.

MODEL AIRPLANE NEWS

PRODUCT REVIEW

Low-price, single-stick, 2-channel radio

HITEC Focus II SS

by DAVE GARWOOD

Here is a radio that many have been waiting for: a single-stick introductory unit that will make flyers of slope-soaring sailplanes, hand-launch gliders and .049-powered planes happy.

The problem with most beginner radios is they have the two channels on two separate sticks. Though this is not inherently bad, it creates a problem when the new pilot graduates to a 4-channel radio.

Four channel and higher radio installations generally place both the roll and pitch control on the right stick. While honest men disagree on whether control is smoother with these functions on the same or opposite sticks, the fact is, a majority of R/C pilots in the U.S. fly with both on the right stick. Chances are your flight instructor will, and if you come to the field with roll and pitch control spread across two sticks, he probably won't be able to help you learn to fly with that plane.

PHOTOS BY LOU GARWOOD

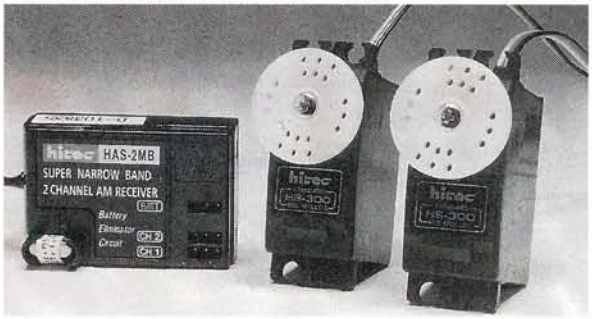
Dave Garwood with Focus II SS transmitter and Canadair CT-114 slope jet.

WHAT'S IN THE BOX?

The Focus II SS transmitter is light and compact. The gimbal feels firm and tight. The transmitter is well balanced and fits easily into the left hand. The only problem noted is that the frequency-control crystal is located on the back, right under the fingertip position. Given the delicate nature of this critical component, I consider this a design fault. I covered the crystal with electrical tape and have had no problem with it in practice.

The receiver is wonderfully small and light and will fit in many installations where a 4-channel unit would present problems.

The standard configuration includes a pair of Hitec HS-300 "standard" servos with mounting hardware and an unusually complete selection of output arms and wheels.



SPECIFICATIONS

Channels: 2

Sticks: single

Modulation: AM

Trims: sliders

Servo-reversing: yes

Power indicator: green, yellow, red LED on TX case

Batteries: none (accepts alkaline or nickel-cadmium)

Receiver: HAS-02MB 2-channel narrow-band

Servos (2): HS-300 (standard size; can be ordered with HS-80 microservos)

Accessories: receiver battery holder; receiver on/off switch; channel number placards

Comments: what slope-soaring, HLG and .049 pilots have been waiting for: a simple, inexpensive, single-stick, 2-channel radio set. Hitec will sell a million of 'em.

Hits

- Compact, well-shaped transmitter case.
- Choice of standard or microservos.
- LED TX battery level indicators are easy to understand.

Misses

- Could be improved if supplied with Ni-Cd batteries.
- Vulnerable location of transmitter crystal (see text).

The radio is light and shaped to fit the hand. The trim sliders worked like the 4- and 6-channel radio sets I'm used to. Probably most important, all equipment functioned reliably, and I'm pleased with the power, smoothness and centering of the Hitec standard servos.

The radio set also comes with a switch harness and a receiver battery holder which accepts four AA-size batteries—either disposable alkaline or rechargeable nickel-cadmium. I used both in my first installation.

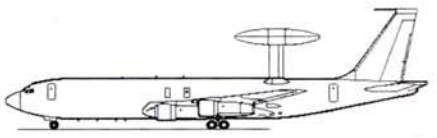
To power the transmitter, I used a Dynamite Ni-Cd Conversion Kit (part no. DYN1910, available from Horizon Hobby*), which contains eight Sanyo AA cells and a 1- to 2-hour 120 volt source charger. I fitted alkaline cells to the receiver battery holder.

FLYING THE FOCUS II SS

After I installed the radio into a Canadair CT-114 slope jet to test both the radio and the sailplane, the combination met my every expectation. The radio is light and shaped to fit the hand. The trim sliders worked like the 4- and 6-channel radio sets I'm used to. Probably most important, all equipment functioned reliably, and I'm pleased with the power, smoothness and centering of the Hitec standard servos.

What's next? I plan to order a pair of Hitec HS-80 microservos and try this radio in a hand-launch glider, as I think the compact transmitter case will make it easier to balance when launching the small glider. HLG and .049 flyers note that the Focus II SS system can be ordered with the HS-80 microservos.

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*



MODEL AIRPLANE NEWS
HOW TO

by JIM SANDQUIST

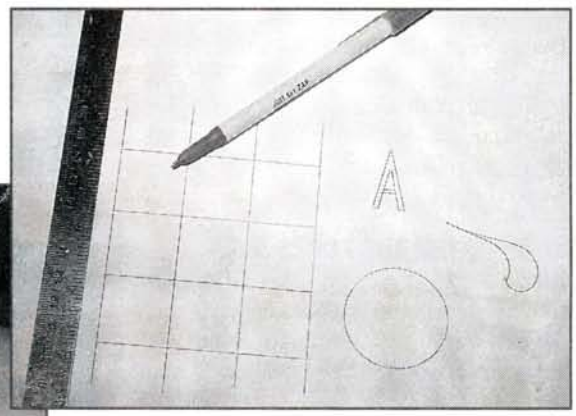
Detail Painting

Liquid Masking Film makes it easy

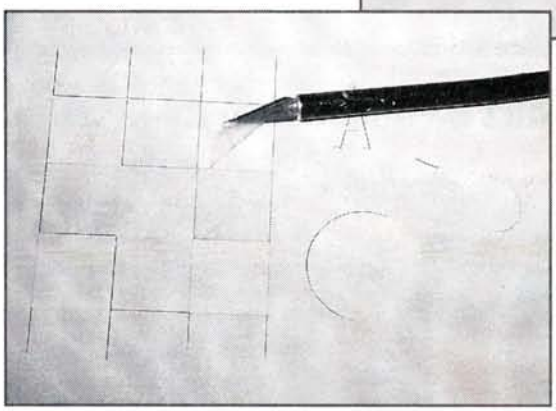
AFTER A DECADE of modeling, I thought I knew nearly all the best products on the market. But recently, I used Bob Dively's* Liquid Masking Film for the first time. This product has been around for years, but I never had the need to try it until I modeled the P-51, "Big Beautiful Doll." The problem was how to apply a checkerboard nose and get straight lines over my panel lines and Duz fasteners. This product really did the job! Give it a try the next time you have a tough masking job. Liquid Masking Film can be used over any nonporous surface and will leave razor-sharp edges over compound curves, panel lines, etc. It's available in 4-, 16- and 32-ounce bottles.

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

1 ***Brush or spray the Liquid Mask onto the surface to be painted. There is no problem with applying the mask over your base color; the Mask has no adhesive and cannot lift the base-color paint. For best results, let it dry overnight.***

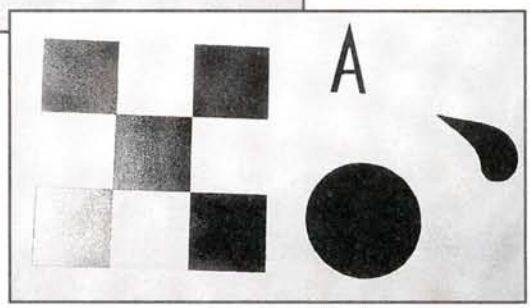


2 ***Draw your pattern right on top of the film! If you can draw it, you can mask it!***



3 ***Use a hobby knife to carefully cut out the area you want to be a different color than your base. Very little pressure is required to cut the film. Now lift away the film from the areas to be painted.***

4 ***Use an airbrush or spray paint. The areas you don't want painted will be protected by the film.***



5 ***The images are crisp and clean with no flashing. The excess liquid masking film lifts right off! I didn't have any paint compatibility problems, but always test with your paint first.***

PHOTOS BY JIM SANDQUIST

MODEL AIRPLANE NEWS
PRODUCT REVIEW

AstroFlight Whatt-Meter & Dischargers

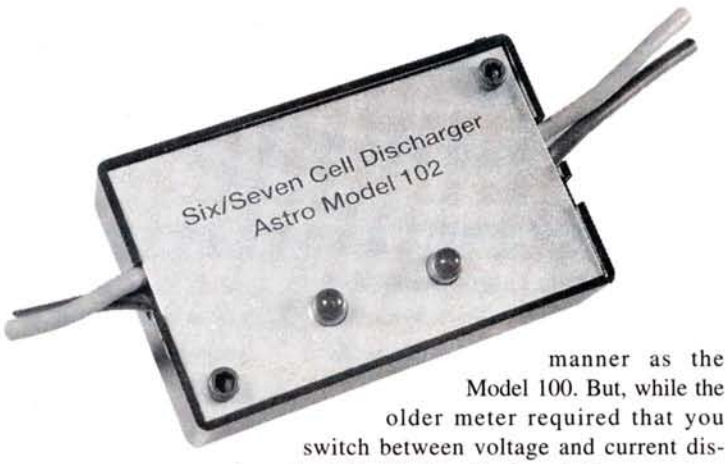
by LARRY MARSHALL

TO SET UP a glow engine properly, you need a tachometer and a controlled touch on the needle valve. But when dealing with electric motors, you need a tool that will dynamically measure the current and voltage associated with the motor circuit. Voltage relates directly to rpm, and current correlates directly with torque production and inversely with flight duration.

Know "watt's" what with electrics!

Fortunately, for the last few years, AstroFlight* have provided electric car, boat and airplane enthusiasts with a super tool for this monitoring task in the form of their Model 100, inline amp/voltmeter.

But AstroFlight's Bob Boucher has never been one to rest on his laurels, and although there was no competing product on the market, he decided to improve on the Model 100. The new Whatt-Meter Model 101 is the result. It comes with AstroFlight's zero-loss connectors installed and measures volts and amps in the same manner as the Model 100. But, while the older meter required that you switch between voltage and current displays, the Whatt-Meter displays both parameters simultaneously. In addition, it multiplies the two values together to provide the number of watts passing through the circuit you're measuring. Use these basic numbers to:



- select props and gear ratios;
- follow a charge/discharge cycle;
- time a motor;
- measure motor constants; and,
- just satisfy curiosity.

The Whatt-Meter also presents the accumulated power transferred while the meter was in place in the circuit. This is very useful when you're monitoring the charge/discharge of a battery.

One of the Whatt-Meter's most remarkable features is that its street price ($60) is pretty much the same as the discontinued Model 100 it replaces. I've used my Model 100 constantly since I bought it several years ago, and I have started to use the Whatt-Meter with a similar intensity. When I'm not using it to investigate and set up motor systems, it's hooked to my AstroFlight 112PK charger where it indicates the state of the charge in progress. If you're even a little bit serious about electric power systems, you need one of these great tools.

ASTROFLIGHT DISCHARGER

Another new tool from AstroFlight makes the Whatt-Meter even more useful for monitoring battery condition: the Six/Seven Cell Discharger. You can take a peak-charged pack, stick your meter between the battery and the discharger, then come back when the monitor light has gone out and record the pack capacity. The discharger will discharge to a consistent point (e.g., the pack voltage is 6.3 or 0.9 volts per cell) so that the capacity values recorded by your Whatt-Meter can be compared throughout the life of your packs. The discharger can also be used as a stand-alone, of course, and will actually discharge two packs at once. Discharge is slow, though, and while it's good for the packs, it will take overnight to discharge a fully charged pack.

In addition to this discharger, AstroFlight offers a 10/12 cell version and one specifically designed to discharge a transmitter and flight pack simultaneously. These dischargers sell for $19.95. For more information, contact AstroFlight, 13311 Beach Ave., Marina Del Rey, CA 90292; (310) 821-6242; website **http://www.astroflight.com/astroflight/index.html.**

**Addresses are listed alphabetically in the Index of Manufacturers on page 142.*

PHOTOS BY WALTER SIDAS

Golden AGE OF R/C

by HAL deBOLT

LOOKING BACK

A retired John Worth having a look into electric power with an L. W. Trainer.

A young John Worth with an early R/C at NACA's Langely Field.

IT'S TIME to say "thanks!" For the past 130 editions of this column, I have done my best to bring you OT R/C history and your interesting stories that described how we all got here, and this is our heritage. All of you have been part of it. The only way I know that I am ringing a bell is when there is a response. I ask for your input as this is your OT R/C place; graciously, many respond! As an example, Bill Friedlander (1015 12th St., Hudson, WI 54016) acts as a clearinghouse for autogyro interests. A past mention of this brought him more than two dozen letters from new "gyronauts," several of whom are from foreign countries. This not only represents a growing interest in autogyros but also that someone is paying attention! So my point is, thanks for the interest and keep it up!

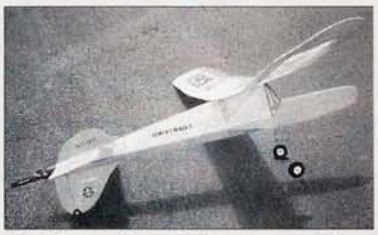
More than 10 years of "Golden Age of R/C" suggests the hobby has gained many new followers and that early info has probably become dim. Thus a review of what and who started all this seems in order, especially considering that new light has been shed on our history along the way.

To set the stage: until the early '30s, rubber and compressed air were the only power for models, and nei-

JOHN WORTH, MR. MODEL AVIATION!

It would not be remiss to say that genial John has done more to promote model aviation than anyone else, and it's safe to say that model aircraft, in one way or another, have been his life.

Briefly speaking: in post WW II times, NACA saw the capabilities of modelers as an asset for their exploratory efforts. Along with other modelers, John served with NACA for a while. In the process, he introduced R/C to their projects.



J. W.'s replica of his Cement Mixer used in '47 to evaluate the Aerotrol—the first commercial R/C.

Al Lewis, as editor of "Air Trails," was a visionary. When Ed Lorenz and Aero Electronics submitted the first Aerotrol R/C system for evaluation, Lewis wanted to flight-test it in a distinctive model. John got the project, and his interpretation of a distinctive model was his Cement Mixer pusher—surely different? Following the OT R/C theme, John has flown replicas of that model in recent times.

Early R/C involved searching for "how-to" info and then the needed components. John Worth and Ed Lorenz collaborated in this need with the Control Research Company. An outstanding product was a neat version of Lorenz's Two-Tuber receiver, which introduced the lightweight airborne equipment that was so desperately needed!

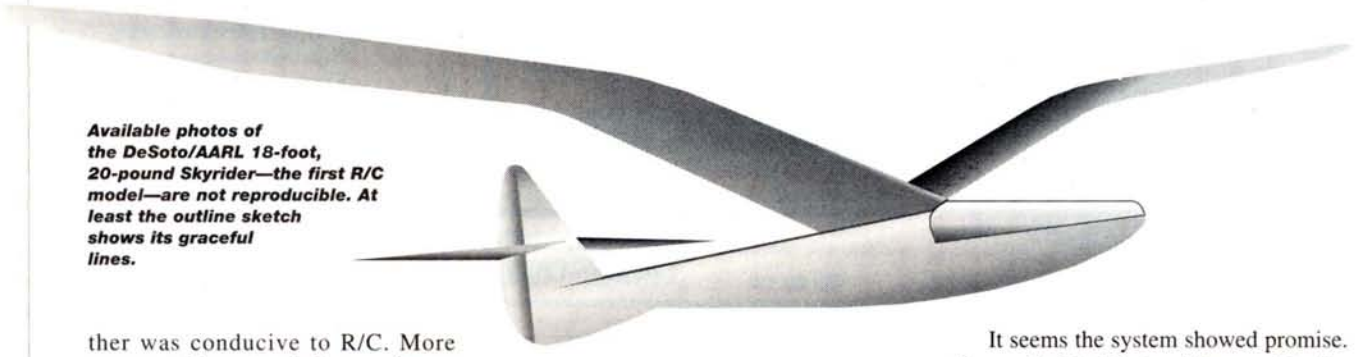
John Worth has always been an avid AMA'er. Mixed with all his other activities, he found time to serve as committee chairman, vice president and then president. The AMA was coming out of the doldrums, and the need for a director became evident. Even with its questionable future, John stepped in as AMA director, which turned out to be a great move for all! John served for 26 years, guiding the AMA up the treacherous, steep climb to the pinnacle it is at today. We all owe much to the AMA and to John Worth for his lifelong efforts.

Ever the promoter, when we envisioned a need for an OT R/C organization, John saw the need, stepped in, found the right people and organized the Vintage R/C Society, which has steadily grown with his guidance.

When retirement comes, a question for most men is, "What to do?" Not so with modelers. It seems retirement is an opportunity to model as never before. John Worth has found subminiature R/C of interest. His first inspiration was ½-size versions of OT R/C designs. His ½-size, 24-inch-span Live Wire Trainer did well with CO_2 power. Later on, he became involved in micro R/C systems (total weight 2 to 3 ounces!), and he has been exploring that and even indoor R/C!

The top guns of Vintage R/C Society. John Worth presents newsletter editor Art Schroeder with his R/C Hall of Fame plaque.

Today's R/C sport is just great. Don't you agree? Only because modelers such as John Worth saw fit to lift it along its way. Thanks, John!



Available photos of the DeSoto/AARL 18-foot, 20-pound Skyrider—the first R/C model—are not reproducible. At least the outline sketch shows its graceful lines.

ther was conducive to R/C. More power with extended capacity was needed. Around '33, "gas engines" appeared; this led to "gas models" that had a habit of flying away! We needed the ability to fly them back home. Every free-flighter of that day dreamed of a way to keep his precious and expensive models.

So it isn't surprising that two of the three early R/C pioneers were accomplished free-flighters. The third became interested in R/C during his involvement with ham radio activity and the Amateur Radio Relay League (ARRL).

Furthermore, today we take for granted R/C systems for any purpose we may desire and can depend on their reliability. It wasn't always so! It could be said that radio itself, as compared to today, was in its infancy in the '30s. Transistors, ICs, Ni-Cds and miniature components were all in the distant future. Dependability required several large tubes, which equated to heavy current drains. Portability meant numerous large, heavy, dry batteries. Although radio was there, it was far from ready for R/C—and especially for model aircraft.

Thus, you see the challenge that faced our R/C pioneers. R/C was a very new realm, and the rudimentary low-power engines were expected to carry the heavy payload aloft! Modelers are visionaries, however, and an obstacle is only there to be overcome!

My early investigations suggested that successful R/C first happened between '34 and '37. I have since learned that three extensive efforts were conducted in that time frame. The people involved were Clinton DeSoto, Walt and Bill Good and Chester Lanzo. Like most anything new, it should be realized that first attempts were not very successful, but they tried and tried again.

Let's discuss Clinton DeSoto and the ARRL first. I should mention that Russ Hull was one of DeSoto's cohorts at the ARRL, which is an organization of ham radio operators who use it as a clearinghouse for ideas, advancements and discoveries pertaining to radio. It was a gold mine for the latest in electronics; with the available info, DeSoto apparently felt radio remote control could be successful. Fortunately for us, he chose to demonstrate it with model aircraft.

To give credit where credit is due, my good friend John Vorhess uncovered some of DeSoto's published chronicles, from which I have gleaned the following details:

Remember, this is all new; everything was from ground zero! They needed an aircraft, but to figure out how large the model had to be, they first had to know the payload, i.e, R/C weight. So first off, DeSoto developed the R/C system—single channel for simplicity. For dependability, he reached into the ham ranks for a proven three-tube circuit on little-used 1750 kilocycles. This would close a relay on command, which, in turn, set an actuator in motion. These early tubes required much voltage and drew heavy current, so the dry batteries alone weighed 3½ pounds, with the receiver and actuator raising the total to 5 pounds.

The actuator was an interesting motor-driven device that apparently didn't have predetermined control positions. A signal started the actuator moving and, with it, the rudder. When the signal was released, the actuator stopped wherever the rudder happened to be. You were supposed to watch the aircraft and use signals to cycle the actuator until the craft was headed as desired. DeSoto explained that the system required slow flight, as you can imagine! The actuator motor was gleaned from an auto windshield washer and weighed 6 ounces! This drove a 1,000:1 alarm-clock gear train whose output moved the rudder.

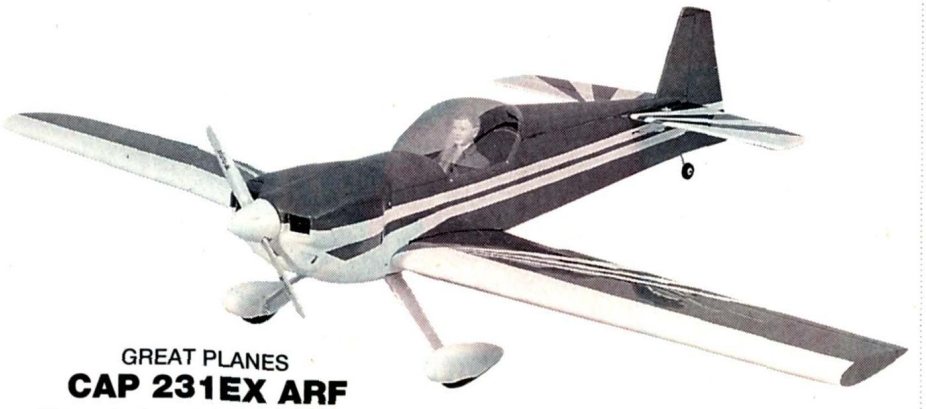
It seems the system showed promise. It was decided that a glider would offer the desired flight style. Knowing the payload, the size was determined. With actual probabilities unknown, the craft was sized to suit a 10-pound payload, just in case! The anticipated aircraft weight was also 10 pounds, so they had a total weight of 20 pounds. Remember, this is just for one control! For a desired 10 ounces per square foot of wing loading, 20 square feet of wing was needed; this necessitated an 18-foot wingspan! Other design features were academic, with careful attention paid to drag reduction.

Another first would be the structural design of an 18-foot-span, 20-pound model. No one had come close to those parameters for a model in those times. They even considered that the model should be rugged, as they anticipated mishaps with the unproved R/C gear, so much thought and effort were put into all aspects of the project! To keep drag low, the fuselage was a classic oval soaring glider shape. The contour was attained with thin plywood to create a stressed-skin structure.

The wing structure, chosen for optimum strength and lightness, prevails today. A full-depth spar was used with ⅛-inch sheeting forward to the leading edge, creating the classic D-tube. The trailing edge was also sheeted with webbing used between the ribs instead of a spar. DeSoto said that during static tests, this wing had great resistance to torsion and flexed a bit spanwise, which proved an asset during some of their cartwheel-type landings. One would have to say the result was a "mighty purty" soaring glider that was a test vehicle for the first of R/C!

The DeSoto story continues, so more the next time. Do remember, this is your OT R/C place. Once again, thanks! ✦

LATEST PRODUCT RELEASES

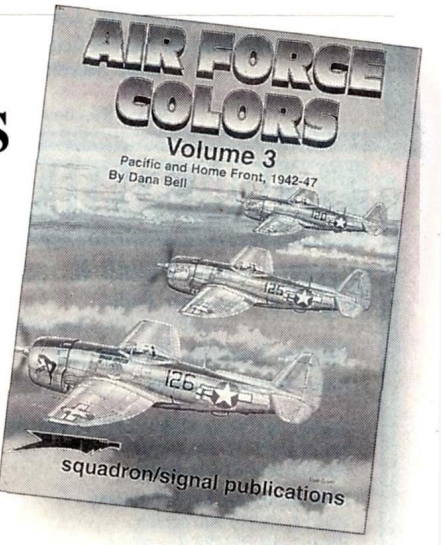


GREAT PLANES
CAP 231EX ARF

This .40-size model features a painted ABS cowl and wheel pants, heavy-duty landing gear, MonoKote covering and Great Planes hardware. Specifications: wingspan—64 inches; wing area—612 square inches; weight—6.5 to 7 pounds; fuselage length—53.5 inches; engine required—.40 to .51 2-stroke or .70 to .91 4-stroke; radio required—4- or 5-channel with five servos.

Part no.—GPMA1230; **price**—$279.99.

Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008; web page http://www.hobbies.net/gpm.



SQUADRON/SIGNAL PUBLICATIONS
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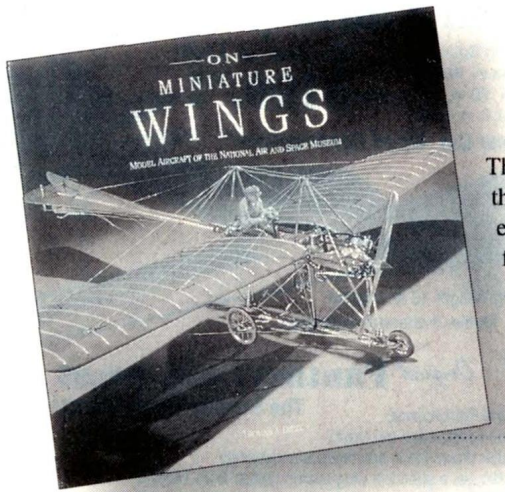
The latest in this series by Dana Bell, Volume 3 covers aircraft that flew against Imperial Japan, aircraft and units that were prepared in the U.S. during WW II, and postwar aircraft through the formation of the U.S. Air Force in late 1947. Each 96-page volume contains more than 250 photos and 16 pages of color artwork by military artist Don Greer.

Squadron/Signal Publications, 1115 Crowley Dr., Carrollton, TX 75011-5010.



LICKLE PUBLISHING INC.
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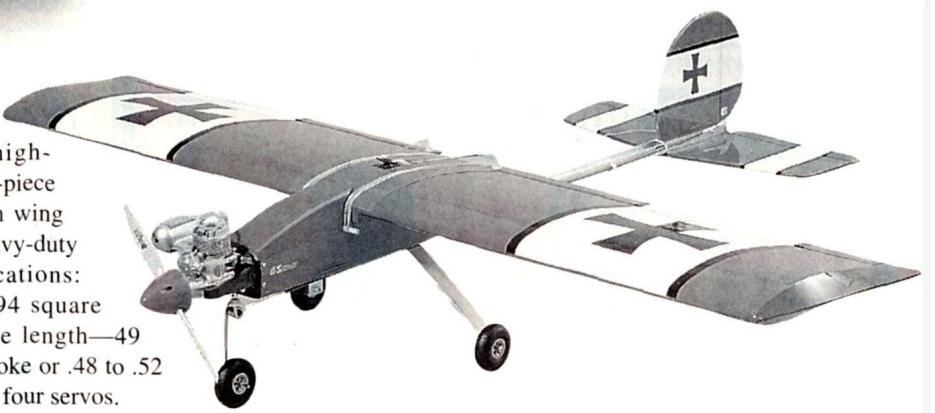
This full-color, 180-page book features the exquisitely detailed model airplanes exhibited in the National Air and Space Museum in Washington, D.C. Static, free-flight, control-line, rubber-band-powered and R/C models are represented.

Price—$34.95.

Lickle Publishing Inc., c/o PRI, 1224 Heil Quaker Blvd., LaVergne, TN 37086-7001; (800) 937-5557, fax (800) 774-6733.



DURAPLANE
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This versatile sport kit features a high-strength PVC main fuselage section, one-piece extruded aluminum tail channel, a foam wing reinforced with hardwood spars and heavy-duty Duraluminum landing gear. Specifications: wingspan—56 inches; wing area—594 square inches; weight—5.75 pounds; fuselage length—49 inches; engine required—.40 to .51 2-stroke or .48 to .52 4-stroke; radio required—4-channel with four servos.

Part no.—DURA1140; **price**—$109.99.

Duraplane; distributed by Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008; web page http://www.hobbies.net/duraplane.

Product NEWS

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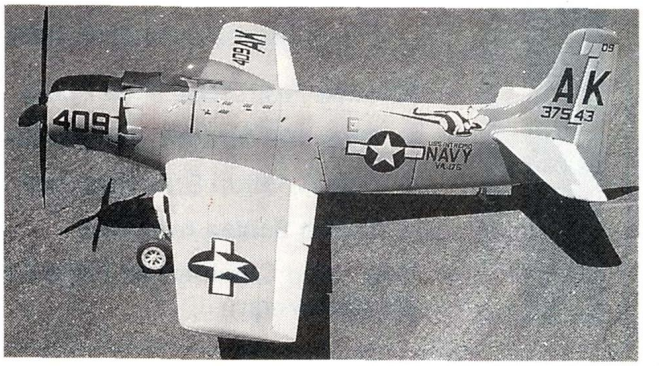
Prices—$439 plus $20 S&H; $489 plus $20 S&H (with optional retract wheel installed).

Icare Sailplanes, 381 Joseph-Huet, Boucherville, Quebec, J4B 2C5 Canada; (514) 449-9094; fax (514) 449-3497; email <ICARE@telts.com>; website http://www.jonction.net/~icare/icare.htm.

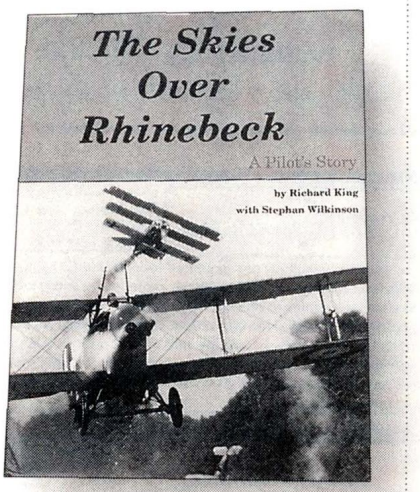


AEROLOFT DESIGNS

AD-6/A1-H Skyraider Dry Transfers

This precision-scale dry-transfer set includes all major markings on the full-scale aircraft and all the standard nomenclature used in full-scale. The 90-inch-span Skyraider model is also available from Aeroloft. These markings are the first in a series of dry-transfer sets for Korean War- and Vietnam-era aircraft.

Aeroloft Designs, 130 W. Hampton, Ste. 20, Mesa, AZ 85210; (602) 649-8662.



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This 260-page book is a collection of stories about Rhinebeck—where aviation history is relived, remembered and created. Thirty-two color pages of the book illustrate the aircraft of Rhinebeck from the aerodrome museum's beginnings in the 1950s to today.

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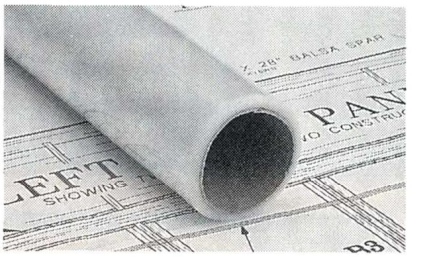
Rhinebeck Aviators Guild, P.O. Box 276G, Red Hook, NY 12571; (800) 350-1007.



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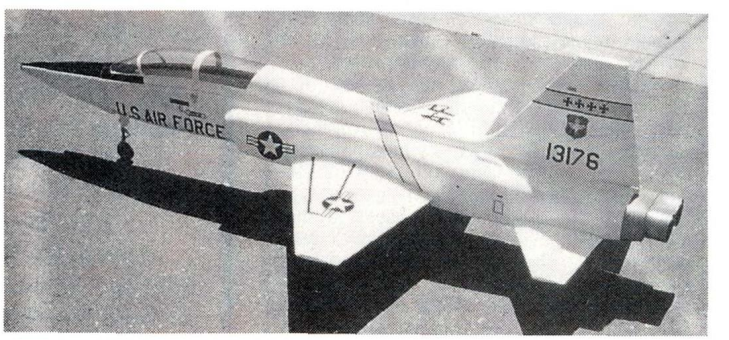
Great Planes Model Distributors, 2904 Research Rd., Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-0008; web page http://www.hobbies.net/gpm.

AIR MAGIC MFG.

T-38 Talon

This model comes with molded, glass composite parts with all flying surfaces assembled in the molds to ensure perfect alignment. The intake ducting and motor mounts have been installed, and its carbon-fiber spars and flex plates for the main gear ensure strength and reliability. The kit also features vacuum-formed plastic parts, a clear canopy, decals and instructions.

Air Magic Mfg., 3200 Dutton Ave. #116, Santa Rosa, CA 95407; (707) 542-5721; fax (707) 586-0412.



CLASSIFIEDS

BUSINESS

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SODA-CAN AIRPLANES—replica biplane detail plans with photos, $7.50 PPD. Early's Craft, 15069 Valley Blvd. SP 26, Fontana, CA 92335. [8/98]

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CASH FOR ENGINES: ignition, glow, diesel, all types; any condition; sale list, too! Estates my specialty! Send SASE for list. Bob Boumstein, 10970 Marcy Plaza, Omaha, NE 68154; (402) 334-0122.[3/98]

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MAGAZINE BACK ISSUES—*American Modeler, American Aircraft Modeler, Aeromodeller, Model Airplane News, Model Aircraft, RCM* and more; 1930s–1990s. For list, send SASE to Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086. [3/98]

MODEL AIRPLANE NEWS, 1930-1980; "Air Trails," 1935-1952, "Young Men," 1952-1956; "American Modeler," 1957-1967; "American Aircraft Modeler," 1968-1975. $1 for list. George Reith, 3597 Arbutus Dr. N., Cobble Hill, B.C., Canada VOR 1L1. [3/98]

PAYING $150 EACH FOR TOY OUTBOARD MOTORS: Mercury, LePage, Orkin, Oliver, Scott, Fuji, Sea-Fury Twin, Evinrude, Gale, Johnson. Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686; (616) 941-2111. [2/98]

WANTED: Old, unbuilt, plastic model kits from '50s and '60s. Send list, price to Models, Box 863, Wyandette, MI 48192. [3/99]

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WANTED: Kraft Signature Series single-stick transmitter, any frequency. Ray Roll, 1472 Exchange St., Alden, NY 14004. [1/98]

WANTED: "Fortress in the Sky" book by Bowers. State condition and price. Raymond Leone, 219 N. Jefferson, Batavia, IL 60510. [12/97]

WANTED: a set of plans for Proctor "Albatross D.VA" kit. Call Jim at (914) 226-5046. [1/98]

WANTED: model engines and racecars from before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [5/98]

WANTED: built or partially built scale Cessna 150, 252, or 172. Glen Mills, P.O. Box 3393, Mission Viejo, CA 92690; (714) 768-0585; fax (714) 458-6455. [1/98]

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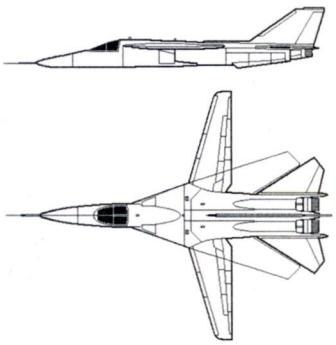
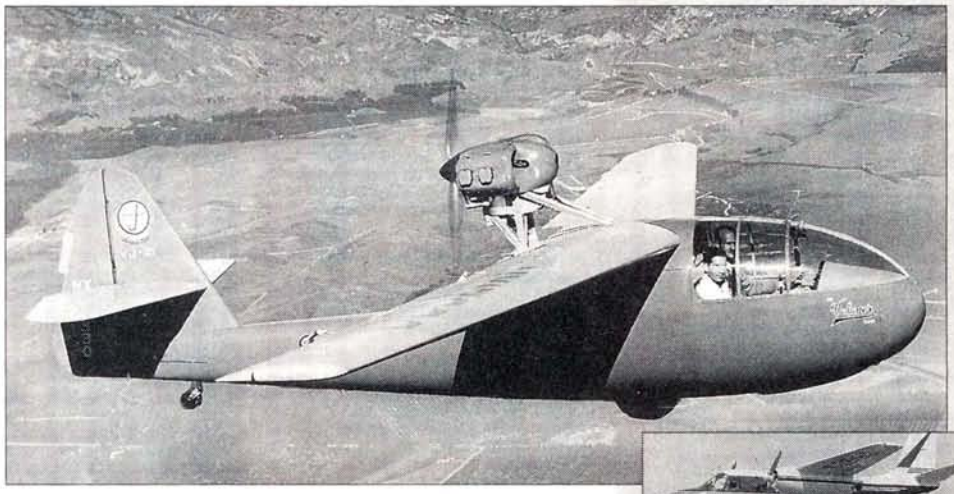


Name THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?



Send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606.

Congratulations to Jessie Kehoe of Canyon Country, CA, for correctly identifying the September '97 mystery plane. The 680 Super Aero Commander was a popular executive business passenger plane used in the '50s and was noted for its high speed and altitude performance. The 680 had a top speed of 260mph and could maintain a 15,000-foot altitude with its full gross load of 7,000 pounds with only one of its two engines running. In June 1953, 26-year-old Ms. Jerrie Cobb flew the Aero Commander pictured to a world altitude record of 30,330 feet.

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to *Model Airplane News*. If already a subscriber, the winner will receive a free one-year extension of his subscription.

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Aeromodel Mfg.,
15437 Proctor Ave., City of Industry, CA 91745; (800) 780-0100 or (626) 961-4616; fax (626) 330-9351.

Airtronics,
15311 Barranca Pky., Irvine, CA 92718; (714) 727-1474; fax (714) 727-1962.

APC Props;
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PLATT POWER

R/C MODELERS love to build and fly models; it's the thing we do. A special few go one step further and become designers. These designers, through their actions, guide the rest of us by inspiring and challenging us to do better. The models they create and the mechanisms they build and refine set the pole a little higher and provide us with a clear target to aim for. The fact that these special individuals are in our midst causes us to challenge ourselves to do better. Such an individual is Dave Platt—the one that many refer to as the father of 1/5-scale.

After being a successful modeler (in all disciplines) for more than 50 years, Dave truly qualifies for the statement "Been there, done that." What's a guy to do after such a long and rewarding run? Well, he simply keeps on going and continues to design things. Dave looks at it simply as continued challenge for himself and self-improvement. And that brings us to his newest challenge—designing engines.

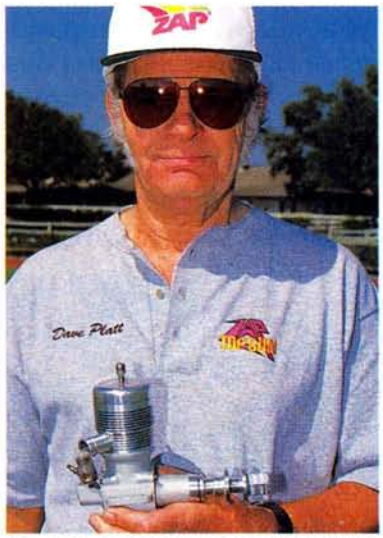
Dave also made this "Racing 29"—a .29-size glow engine for vintage control-line Class B team racing.

Here, you can see the long crankshaft design and the rear drum-induction setup with the carb located on top. To design his engine, Dave used David Gierke's book, "2-Stroke Glow Engines for R/C Aircraft" as a guide.

Now mind you, Dave didn't just wake up one day and decide to design and build model airplane engines just for the fun of it. The reason he's doing it is to solve some modeling problems associated with his newest project, a 2-inch-to-the-foot-scale T-28 Trojan.

Dave wanted an engine that could be completely hidden behind the scale dummy radial engine in his T-28. This would require an engine with a long crankshaft and one with a rear-mounted carburetor. Dave also wanted the carb to be placed high enough on the engine so it would be above the mounting rails and in line with the fuel tank. To accomplish this, he chose a rear drum-induction design. Finally, he wanted to spin a scale propeller, and this required a lot of torque. A big diesel engine was his answer.

Dave has always had a lathe in his shop, but for the most part, he made items that were used for cosmetic purposes in his models. It wasn't until he purchased a short-bed Monarch tool-room lathe that he was able to achieve the close tolerances needed for something as complicated as an internal combustion engine. Dave also bought a Bridgeport milling machine to complete his home machine shop. But just having precision tools doesn't mean you can start making precision-cut parts. Dave went back to school to learn how to fully use these machines. After many evenings in a local community college vocational classroom/workshop, Dave became proficient in machine use and thus able to build what he needed to see his T-28 project through.



The man and his machine: Dave Platt and his homemade 1.5ci diesel engine. Dave made the engine specifically for his new T-28 model.

The fruit of his labor is a 25.3cc (1.50ci) diesel engine that weighs 47 ounces and will turn an 18x6 prop at 7,000rpm. Both bore and stroke are 1.25 inches. The crankcase and other aluminum parts are made of 6061 and 2024 alloy while the sleeve is made of a lead/steel alloy. The piston and contra-piston are made of meehanite. The crankshaft is made of oil-hardened steel and is ball-bearing supported. The engine has a total of five support ball bearings. The engine has a lapped piston/sleeve, but Dave says that making piston rings and chroming sleeves is still in the future. The engine burns P.A.W. diesel fuel.

The time to build the engine was about a month, but the first one he designed and built—a .15-size diesel—took four months. Dave says that he can now build an engine in about a week. Much of this time is not spent on simply cutting away any metal that doesn't look like an engine. Rather, it is spent designing and building the many holding fixtures used to secure the engine parts during machining. Just about every part needs its own special fixture. It's a lot of work for a single engine, but Dave says it's well worth it because in the end, it's part of the hobby and a lot of fun.

In case you were wondering, Dave will not be producing a line of Platt diesel engines, but the T-28 will be Dave's next kit (available April '98).

—Gerry Yarrish